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EPA Region 5 Records Ctr.



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United States
Environmental Protection
Agency

Region 5
Waste Management Division
77 West Jackson Blvd.
Chicago, Illinois 60604



Southeast Rockford Rockford, Illinois

**Operable Unit
Remedial Action Report**

December, 1992

REMEDIAL ACTION REPORT
for the
SOUTHEAST ROCKFORD GROUND WATER CONTAMINATION SITE
OPERABLE UNIT

I. INTRODUCTION

The Southeast Rockford Ground Water Contamination site is a residential area of approximately 0.7 square miles formerly served by private wells which is located within the city limits of Rockford, Illinois. The area was first discovered in 1984 when the Illinois Environmental Protection Agency (IEPA) investigated reports of illegal disposal of plating waste in a dry well. Analysis of several neighborhood wells detected no metals or cyanides, but instead found high levels of chlorinated solvents, including 1,1-dichloroethane, 1,1,1-trichloroethane, and trichloroethylene. Subsequently, the Illinois Department of Public Health, the Winnebago County Health Department and U.S. EPA conducted further sampling in the area.

The Southeast Rockford Ground Water Contamination site was proposed for the NPL in June 1988, and was made final in March 1989. It was designated as a State-lead site.

In August 1989, in response to the Administrator's 90-day study, Region V's Emergency and Enforcement Response Branch took samples within the Southeast Rockford site to determine if an immediate removal action was warranted. This sampling confirmed that private wells in the area were contaminated with 1,2-dichloroethane at concentrations substantially above the Removal Action Level (RAL). Other volatile organic compounds (VOCs) were also detected at lower levels. U.S. EPA consequently initiated a time critical removal action under which bottled water was offered as a temporary measure to residents whose well water analysis results revealed VOC levels greater than or equal to 25% of the RAL. In mid-December 1989, these residences were equipped with point-of-use filters as an intermediate solution to the contaminated drinking water. U.S. EPA ultimately extended water mains and provided hookups to city water to 283 residences with private wells contaminated with VOCs at levels greater than or equal to 25% of the RALs. This time critical removal action was completed in December 1991.

In June 1990, IEPA began the Remedial Investigation/Feasibility Study (RI/FS) process by sampling a larger area as part of an operable unit. The objective of this sampling was to see if any homes had wells with levels of VOCs below the time critical removal action cutoff, but above Maximum Contaminant Levels (MCLs) as defined in the Safe Drinking Water Act. The IEPA sampling revealed an additional 243 homes that needed to be connected to the City of Rockford's municipal water supply system.

The Proposed Plan for this operable unit was released to the public by the State of Illinois in March 1991. This Proposed Plan described as the preferred alternative the connection of affected homes to City water. The alternative also included a temporary granulated activated carbon (GAC) water treatment facility to be installed at a seldom-used contaminated municipal well to assure sufficient capacity for the residences being added to the system. The public hearing on the Proposed Plan was held April 17, 1991. The Record of Decision (ROD) was signed June 14, 1991.

This operable unit began under the remedial program; however, time constraints would not have allowed the work to be completed during the 1991 construction season if remedial authorities were used. Remedial contracting procedures are much more complicated and therefore take much more time. To have used remedial authorities would have meant that affected residents would have had to have consumed water contaminated at levels above MCLs for another year.

The removal program, through its streamlined process and contracting authorities, had the ability to implement the project more quickly than could have been done by the remedial program. Consequently, this remedial action operable unit was conducted using removal authorities in order to implement the project and eliminate the public health threat during the summer of 1991. This required that a Removal Action Memo be signed, in addition to the ROD, including a provision that the removal program constraints of 2 years and 2 million dollars be waived.

II. CHRONOLOGY OF EVENTS

June 12, 1991 - Action Memo signed

June 14, 1991 - Record of Decision signed

June 18, 1991 - RD/RA Negotiation Start and Completion [122(a) letter sent]

June 20, 1991 - RD funding package signed; RD began

July 5, 1991 - RA out for bid

July 10, 1991 - Contractor selected

July 17, 1991 - Superfund State Contract and RA funding package signed; RA contract awarded

July 18, 1991 - Construction began

November 20, 1991 - Press availability session and site tour of the GAC facility (project nearly complete -

all affected homes receiving City water, GAC vessels in place).

July 17, 1992 - Construction completed

November 19, 1992 - Final inspection

November 19, 1992 - Remedy determined to be operational and functional

III. PERFORMANCE STANDARDS AND CONSTRUCTION QUALITY CONTROL

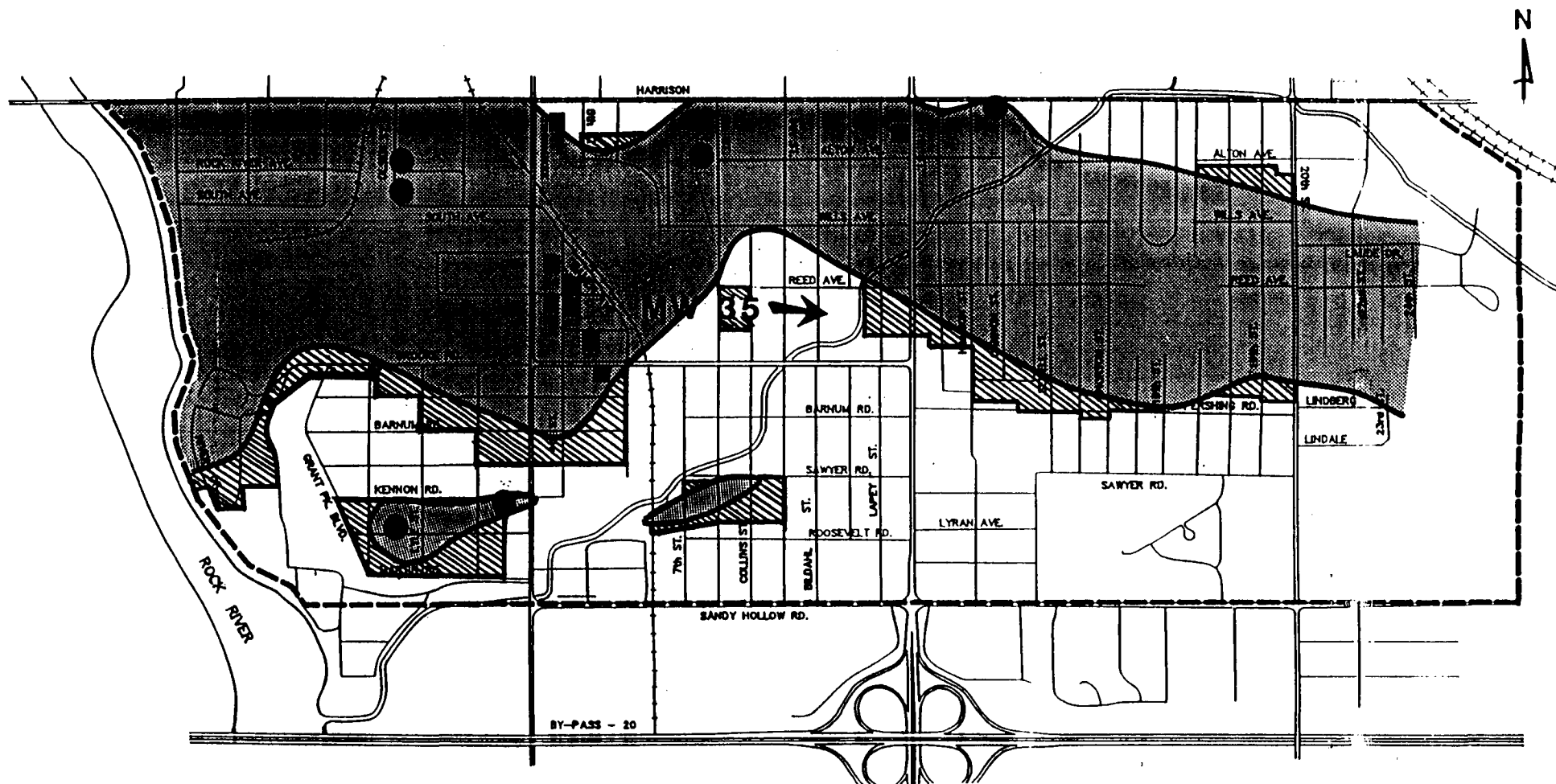
The RI/FS was prepared by IEPA under a Cooperative Agreement with U.S. EPA. To determine the scope of the needed remedial action, IEPA relied primarily on MCLs developed under the authority of the federal Safe Drinking Water Act. Due to the fact that no risk assessment is required for an operable unit under the NCP (Preamble, page 8704), risks were characterized by the use of MCLs. An MCL represents the maximum permissible level of a contaminant in drinking water which is delivered to the consumer's tap and used by the general public, and is a legally enforceable standard. The standards reflect the best achievable levels considering the occurrence, relative source contribution factors, monitoring capability, cost of treatment, available technology and health effects.

Contamination was detected above the MCL for one or more contaminants in 25 of the 117 wells sampled by IEPA. Contamination was detected at levels below MCLs at 60 of the 117 wells sampled. All but one of these wells is located west of 11th Street. The frequency of detection above MCLs is shown below for each contaminant.

<u>CONTAMINANT</u>	<u>NO. OF WELLS ABOVE MCLs</u>
TCE	22
1,1-DCE	11
PCE	9
1,1,1-TCA	2
1,2-DCA	2
cis-1,2-DCE	2
vinyl chloride	1

The plume of contamination, as defined in the operable unit RI, includes the areas within which an MCL for one or more of the target compounds has been exceeded and, in some areas, a "buffer zone", which consists of those areas between the last well sampled showing contamination above MCLs and the first well sampled that was found below the MCLs (see Figure 1). This buffer zone allows for uncertainties inherent in the position of the plume boundaries; the potential exists that the wells within the buffer zone are/or may be contaminated at levels in excess of

SOUTHEAST ROCKFORD



● Samples that exceeded Oct. 1987 Removal Action Levels in IEPA sampling, June, 1990, and were subsequently connected to City water in summer, 1990.

■ Samples that exceeded April 1991 Removal Action Levels in IEPA sampling, June 1990, and were not connected to City water.

Shaded area is extent of plume with VOCs above MCLs (NOTE: The most severe part of this plume has already been connected to City water under a removal action in 1990.)

Adapted from: CDM Southeast Rockford Operable Unit Draft Final Feasibility Study, March 1991.

SCALE:



Buffer zone; these areas also connected to City water in 1991.

FIGURE NO.

1

MCLs. The buffer zone boundary attempts to follow street boundaries where possible.

After the Record of Decision was signed in June of 1991, U.S. EPA began the design of the operable unit. The number of houses connected, the amount of water main, and the number of service connections, water meters, and wells to be abandoned was slightly modified by U.S. EPA during the design, as indicated below.

ESTIMATED FROM FS

ACTUAL CONSTRUCTION

21,000 feet water main
243 homes
243 water meters
243 wells abandoned

18,000 feet water main
264 homes
264 water meters
238 wells abandoned

The technical specifications for this project can be subdivided into basically 3 portions: water mains/connections/plumbing, GAC, and well abandonment.

The City of Rockford Water Department has specifications covering the locations, depths, materials and procedures for installation of water mains. In addition, the City has specifications dealing with the service connections between the water mains and the residential property lines (see Attachment I). Plumbing codes which were followed for the work between the property lines and the taps are from the Illinois Department of Public Health, Plumbing Code, edition 1986 and City of Rockford, Water Department Specifications, current issue (see Attachment II).

The specifications for the GAC unit and related appurtenances were prepared by the design contractor and are attached as Attachment III.

The Illinois Department of Public Health has requirements for the sealing of abandoned wells. These requirements, which come from the Illinois Water Well Construction Code, were met in abandoning all 238 wells for this project (see Attachment IV).

As of November 14, 1991, all necessary water mains were installed, and all 264 affected homes were connected to City water. All 238 residential wells have been properly abandoned. As of the date of the final inspection, the GAC treatment facility has been determined to be complete and functioning properly.

IV. CONSTRUCTION ACTIVITIES

The design of the Southeast Rockford Operable Unit was conducted by IT Environmental Programs, Inc. under the Emergency Response Cleanup Services (ERCS) contract. Assistance in the design was provided by Jones and Neuse, Inc. Pyramid Mercantile and

Maintenance performed the installation of the water mains, service connections, and plumbing. The GAC vessels were purchased from Calgon Corporation, and the wells were abandoned by C. Martin and Sons Well Company.

The water main connections were installed first, and as stated previously, were completed by November 14, 1991. Landscaping was done in the areas on residential property that were disturbed in completing the connections. This work was completed by spring of 1992.

During the time that the water main connections were being made, the GAC facility was being designed and by November 20, 1991, the vessels were in place. The building which houses the GAC facility was constructed in December 1991. The purposes of the building were: to keep the facility operational in winter; to protect the vessels from vandalism; and to make the facility visually more appealing by blending into the city park where the well and GAC facility are located.

In the process of preparing the site where the GAC facility is located, 2 deteriorating tennis courts and 1 usable basketball court had to be destroyed. In exchange for destroying these recreational facilities, U.S. EPA agreed to construct 1 new basketball court for the City of Rockford Park District.

This Operable Unit was extremely successful. The chronology reveals that the project proceeded from ROD signature to construction in 34 days. Four months later, the public health threat was eliminated. In addition, the project was completed at approximately 88% of the cost estimated in the FS. The FS projected that the operable unit would cost \$3,057,000, and the project was actually constructed for approximately \$2,704,000. The final exact cost figure for the Operable Unit will not be available until spring 1993 because this project is subject to cost definitization by the ERCS contractor and U.S. EPA.

The only problem encountered in the operable unit was related to the information provided in the FS relative to the addresses of affected homes, and the amount of water main and number of service connections needed. Part of the discrepancy is accounted for by the fact that a number of residents paid for connections to City water on their own and did not notify IEPA. However, the list contained many other discrepancies, including homes with incorrect addresses, and it omitted a number of homes that were on private wells and were eligible for City water. In several cases, water mains were projected in the FS in areas that already had water mains and visible fire hydrants. This problem was discovered as a street being surveyed for a water main was noted to already have fire hydrants. A number of homes that were projected to need service connections and plumbing work already had the service connection installed to the property line.

It was evident that the information contained in the FS was not field verified. Consequently, all the information related to the scope of the project had to be checked by the RD contractor prior to design actually beginning. This activity required extra time and money, and time was the one variable that was in short supply on this operable unit. Although the problems with the lists were eventually overcome, the lesson learned from this problem is that the information in the FS should be field verified by the FS contractor.

V. FINAL INSPECTION

Appendix A is a punch list of unresolved items submitted to U.S. EPA by the City of Rockford on July 2, 1992. As of the date of the final inspection, all punch list items were resolved. The attendees at the final inspection were:

Karen Vendl, U.S. EPA
Paul Takacs, IEPA
Terry Ayers, IEPA
Bob Wengrow, IEPA
Wally Parson, City of Rockford
Bob Nimmo, City of Rockford

VI. CERTIFICATION THAT REMEDY IS OPERATIONAL AND FUNCTIONAL

There was essentially no shakedown period for the water mains/connections/plumbing work. As sections of water main were installed and tested, they were put into service. As service connections were installed and flushed, and as plumbing connections into the households were made, city water was supplied.

The GAC vessels were filled with carbon in mid-April and were not operated until June to determine if they were operational and functional. There was a computer programming problem with the City's system which prevented operating the GAC sooner. (This problem was not the responsibility of U.S. EPA, and was corrected by the City of Rockford.)

Another problem with the GAC facility arose during the summer of 1992. Compressed air was somehow finding its way into the vessels during operation of the system. This problem was corrected by the installation of a "syphon loop" on the system during the summer of 1992.

The City provided the punch list discussed above, and all items have been resolved as of the date of the final inspection. See Appendix B for letters from the City and State regarding acceptability of the operable unit.

VII. OPERATION AND MAINTENANCE

The Operation and Maintenance Plan was written by IEPA, and is attached as Appendix C.

VIII. SUMMARY OF PROJECT COSTS

The final costs of the project were \$2,704,000. This compares to a cost of \$3,057,000 in the FS, or 88% of the estimate.

The water main/service connection part of the operable unit was divided into two portions with 11th Street as the north/south dividing line. The main reason for this was that a portion of the affected area was in the floodplain of the Rock River, which is west of 11th Street. Consequently, the design of this portion was more complicated and required more time to complete. Because time was critical, bids were let for the larger, less complicated portion of the project when the design of this portion was ready.

The initial contract with the construction contractor was for 9400 feet of water main, 14 fire hydrants, 18 valves and 199 service connections in the area east of 11th Street.

Change order number 1 was for an additional 8300 feet of water main and related appurtenances for the area west of 11th Street.

Change order number 2 was for the plumbing connections for the entire project area.


Change order number 3 was for the piping and the foundation for the GAC unit.

Change order number 4 was for the building to house the GAC unit.

Change order number 5 was for final site work around the GAC building, including asphalt for the drive and a fence.

The GAC unit was procured through a sole source contract to Calgon Carbon Corporation.

APPROVAL:


Richard C. Karl, Chief, IL/IN
Remedial Response Branch

DATE: 12-21-92

DISAPPROVAL:

DATE:

- Appendices:
- A. Punch List of Unresolved Items
 - B. Letters from City and State Regarding Acceptability of Operable Unit
- Attachments:
- I. City of Rockford Water Department Specifications
 - II. IT Corporation Statement of Work - Reference to Plumbing Codes
 - III. Specifications for GAC Facility
 - IV. Illinois Department of Public Health, Requirements for Sealing Abandoned Wells

APPENDIX A
PUNCH LIST OF UNRESOLVED ITEMS

July 02, 1992

APPENDIX A

Mr. Ken Theisen
On-Scene Coordinator
U.S.EPA. - ERU
230 South Dearborn Street
Chicago, Illinois 60604

Re: Southeast Rockford Groundwater Contamination Rockford
Illinois, Unit Well #35 G.A.C. Filters.

Dear Ken,

The following punch-list of items for UW #35 G.A.C. filter are:

- 1.) Head loss gauges for each skid are not set up correctly for parallel flow.
- 2.) Cracked fitting (marked) on vessel #2 (on south end.)
- 3.) Pressure gauge on vessel #5 (marked).
- 4.) One of the five (5) vessel's drain line valves does'nt seat correctly, which causes drain line to leak at times.
- 5.) *Pyramid* There is small leak on influent line in well house at north wall.
- 6.) *Pyramid* Question if the air-relief valve works in wellhouse; it leaks water when it first starts up and also has a loud noise at first start up.
- 7.) Air entering the filter vessels: air drawn in from drain lines for about 30 minutes after system start up.
- 8.) After the above items have been corrected the City would like Calgon Carbon to have a rep. on-site for a day for system run thru.

Call if you have any questions.

Sincerely,

City of Rockford P.W.

Wallis J. Parson

pc: Bob Nimmo, Superintendant

APPENDIX B

**LETTERS FROM CITY AND STATE REGARDING ACCEPTABILITY OF
OPERABLE UNIT**



CITY OF ROCKFORD, ILLINOIS

CHARLES E. BOX
MAYOR

1111 CEDAR STREET
61102-2196

ALAN J. WERNER
PUBLIC WORKS DIRECTOR

November 24, 1992

Karen A. Vendl, Geologist
U. S. ENVIRONMENTAL PROTECTION AGENCY
Region V
230 South Dearborn Street
Chicago, IL 60604

RE: SOUTHEAST ROCKFORD OPERABLE UNIT

Dear Ms. Vendl,

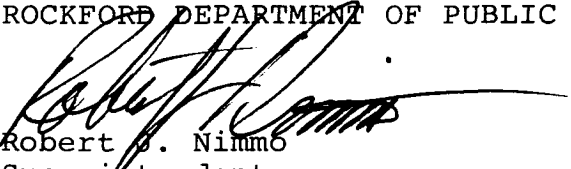
The City of Rockford appreciates your traveling to our city last week to assist with the final inspection of the Rockford Municipal Well #35 Granular Activated Carbon Facility. The results of our inspection of this marvelous facility, coupled with our knowledge of the excellent water distribution system work previously completed, adds up to an extremely effective Operable Unit.

As Responsible Certified Operator of the Rockford Water System, I find the Operable Unit to be totally acceptable, operational in every regard, and complete to the point where each component is in place and functionally correct.

I am extremely impressed with the Operable Unit completed in Southeast Rockford and wish to commend you and your staff for a job well done. If I can be of service to you, please feel free to contact me.

Sincerely,

ROCKFORD DEPARTMENT OF PUBLIC WORKS



Robert B. Nimmo
Superintendent
WATER DIVISION

pc: Alan J. Werner
Director of Public Works

Wallis J. Parson
Assistant Superintendent
Water Division

APPENDIX C

OPERATION AND MAINTENANCE PLAN



State of Illinois

ENVIRONMENTAL PROTECTION AGENCY

Mary A. Gade, Director

2200 Churchill Road, Springfield, IL 62794-9276

217/785-3912

Refer to: L2010300074 -- Winnebago County
Southeast Rockford Groundwater Contamination - Rockford
Superfund/Compliance

December 3, 1992

Ms. Karen A. Vendl
Remedial Project Manager
USEPA-Region V, HSRL-6J
77 West Jackson Boulevard
Chicago, Illinois 60604

Dear Karen:

On November 19, IEPA, USEPA and the City of Rockford conducted the final inspection for the operable unit. This inspection satisfied Section 19.B of the Superfund State Contract for this site.

As IEPA has no outstanding issues regarding the operable unit, the only remaining item needing approval is the remedial action report. If you have any questions or concerns, please do not hesitate to call.

Sincerely,

A handwritten signature in dark ink, appearing to read "Paul E. Takacs", written over a horizontal line.

Paul E. Takacs, Project Manager
Federal Sites Management Unit
Division of Remediation Management
Bureau of Land

cc: Terry Ayers
Jim Janssen
Division File

IEPA OPERATION AND MAINTENANCE PLAN

SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION OPERABLE UNIT

ROCKFORD, ILLINOIS

The Illinois Environmental Protection Agency (IEPA) hereby submits the following Plan for the purposes of demonstrating state assurance as required by Section 300.510(c)(1) of the National Contingency Plan (NCP). Pursuant to Section 300.510(c)(2) of the NCP, IEPA shall assume responsibility for the implementation of operation and maintenance (O&M) of the operable unit after this operable unit remedial action has been determined to be operational and functional as provided in Section 300.435(f) of the NCP as long as deemed necessary by both IEPA and the United States Environmental Protection Agency (USEPA).

In addition to the above-mentioned statutory requirements, this document satisfies the needs of the Superfund State Contract Between the (IEPA) and (USEPA) for an Operable Unit Remedial Action at the Southeast Rockford Groundwater Contamination Site.

As defined in the Record of Decision for the Southeast Rockford Groundwater Contamination Operable Unit (June 14, 1991), the selected operable unit remedial action is divided into the following components:

1. Water main extensions and connections of affected residences at the Southeast Rockford Groundwater Contamination Site to the City of Rockford water distribution system (hereinafter watermain extensions).
2. Reactivation of City of Rockford Municipal Well #35 and the development of a granular activated carbon (GAC) treatment unit system to be operated at this well (hereinafter GAC units).

I. O&M of Watermain Extensions

The City of Rockford (City) shall be responsible for the O&M of all watermain extensions provided to residents as noted in the "Southeast Rockford Residence Water Supply Project - Phase II As-Built Drawings" (IT Corporation January, 1992). In addition, the City shall bear responsibility for the O&M of all associated fixtures (e.g. fire hydrants, valves, etc.) noted in the above-mentioned drawings.

Fixtures on City right-of-way shall be properly maintained by the City and all repairs to both the watermain and associated appurtenances will be in accordance with applicable state and local regulations and guidelines. It will be the responsibility of the landowner to maintain extensions/appurtenances on private property.

II. O&M of Granular Activated Carbon (GAC) Treatment Units

The GAC units that were installed by Calgon Carbon Corp. at the City's Municipal Well #35 consist of the following components: Two (2) carbon absorber system trains, including all internal instrumentation, and a single carbon vessel. Each train consists of two (2) downflow absorber vessels, flow control valves and inter-connecting piping between the two vessels of each train. The five vessels will be used to treat 3,500 gpm total influent flow from Well #35.

Operation of the GAC units shall be under the direction of an Illinois Certified Water Supply Operator in accordance with Title 35 Environmental Protection, Subtitle F, Chapter 2, Part 680 and subject to applicable Illinois public water supply regulations as defined in 35 Environmental Protection, Subtitle F, Chapter I. In addition, PERFORMANCE OF ANY O&M OF THESE TREATMENT UNITS MUST BE IN ACCORDANCE WITH ALL MANUFACTURER'S OPERATING MANUALS (see Operations Manual - Granular Activated Carbon System for City of Rockford, October 1991).

Changeout of carbon in the absorber trains will occur when VOCs are detected in the absorber train effluent. All drinking water analyses will be performed in accordance with USEPA methods for drinking water analyses and procedures. The frequency of carbon changeout will be determined by the unit's ability to perform within design specifications and its ability to provide safe drinking water to users. Spent carbon and settled material in the absorber trains will be analyzed by the TCLP procedure to determine waste characteristics. All spent carbon and/or settled material from the absorber trains shall be disposed of in accordance with applicable federal, state and local regulations.

If the GAC unit is to be operated on an intermittent basis, O&M guidelines as noted in the Calgon Operations Manual will be followed.

III. Water Sampling and Monitoring Program

It will be the responsibility of the City to implement this program in order to ensure that the GAC units are functioning properly. Sampling water quality at intermittent steps in the overall treatment process will assist in process optimization, help locate problem areas and determine how often the carbon needs to be replaced.

Influent water will be sampled according to the standard procedures as outlined in the Southeast Rockford Operable Unit Investigation QAPP (CDM June, 1990). Parameters to be tested for and sampling frequency are noted below. If the GAC unit is to be operated on an intermittent basis, the monitoring requirements in III.E shall apply.

A. Daily Analyses

Plant Influent
pH
Visual Color
Temperature

Plant Effluent
pH
Visual Color
Temperature
Residual Chlorine

B. Weekly Analyses

Carbon Absorber Train Influent and Effluent: Total VOCs

Note: See special conditions for VOC sampling (Section III.D).

C. Monthly Analyses

Plant Influent and Effluent: Total VOCs

D. Special Conditions for VOC Sampling

1. If no VOCs are detected in the plant influent, further VOC analyses will not be required.
2. After initial startup of the plant, if VOCs are detected in the plant influent, then VOC analyses will be performed in the effluent of the first carbon absorber system train.
3. If VOC concentrations from any carbon absorber system train effluent equal the system train influent, the carbon in the system train will be deemed "exhausted". Once the carbon is exhausted, testing will no longer be required at the effluent of that system train. VOCs will then be tested for in the effluent of the next system train only (e.g. after carbon in the first system train is exhausted, sampling will then be at the effluent of the second system train). Once VOCs are detected in the effluent of the second system train, all carbon units will be changed in accordance with Section II of this Plan.

4. If VOC monitoring notes an increase in VOC levels in the plant influent, the City will notify IEPA and USEPA.

E. Water Sampling and Monitoring Program for Intermittent Usage

If the GAC units are to be operated on an intermittent basis, VOC monitoring as mentioned in Section III.B and III.D shall be carried out whenever the unit is reactivated, but not more than six times per month. The monthly sampling requirements noted in Section III.C shall be carried out on the last day of operation during the month and daily monitoring requirements (Section III.A) shall still be applicable.

IV. Addresses for All Correspondence

All documents, plans and correspondences relative to this O&M Plan shall be sent to the following primary contacts. Their addresses are noted below:

Paul E. Takacs
State Project Manager
Illinois Environmental
Protection Agency
2200 Churchill Road
Springfield, IL 62794-9276

Karen A. Vendl
Remedial Project Manager
United States Environmental
Protection Agency
Region V, HSRL-6J
77 West Jackson Boulevard
Chicago, IL 60604

Robert J. Nimmo
Superintendent, Water Division
Rockford Department of Public Works
City of Rockford
1111 Cedar Street
Rockford, IL 61102-2196

Any party may change its primary contact by providing advanced written notice to all other parties.

V. Change of O&M Responsibilities

O&M responsibilities for the operable unit have been outlined in subsequent sections of this Plan. In the event that changes in overall O&M responsibilities are sought, the party requesting the change must make written notification to all other parties documenting what needs to be changed and the rationale for the proposed changes. All parties shall be involved in any decision to change any element of this Plan.

ATTACHMENT I

CITY OF ROCKFORD WATER DEPARTMENT SPECIFICATIONS

ATTACHMENT I

CITY OF ROCKFORD
WATER DEPARTMENT
SPECIFICATIONS

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1.0 SPECIAL PROVISIONS

The "Standard Specifications for Road and Bridge Construction" prepared by the Department of Transportation of the State of Illinois and adopted by said Department on July 1, 1988, and the "Standard Specifications for Traffic Control Items" prepared by the Department of Transportation of the State of Illinois and adopted by said Department on February 1, 1984 in conjunction with City of Rockford Water Division Specifications - Revised, dated 1982, and the General Provisions and Technical Specifications for Sanitary Sewer Construction in the Sanitary District of Rockford dated October 24, 1983, and all standards and revisions adopted by the Board of Trustees for said Sanitary District of Rockford shall govern bidding and construction of the proposed improvements. Style, type, and grade of all materials used for construction shall be in accordance with the City of Rockford Public Works Department, City of Rockford Water Division and Sanitary District of Rockford prior to bidding, ordering or placing any materials.

Herein after the term "Owner" shall mean the USEPA, the term "Engineer" shall mean IT Environmental Programs, (ITEP) or its designated representative, and the term "Contractor" shall mean the entity who proposes to perform the work herein described or its designated subcontractors.

The following Special Provisions supplement the said specifications and, in case of conflict with any part or parts of said specifications, these Special Provisions shall take precedence and shall govern. The City of Rockford Water Department Specifications follow these Special Provisions.

1.1 GENERAL

1.1.1 Description of Work

The contract work consists of constructing an 8" water main with

services to the property line. The project will also include road surface patching and other incidental items associated directly with the installation of the pipe.

1.1.2 Work Restrictions

All work shall be installed in accordance with the latest editions and addenda of the following:

1. N.E.M.A. - National Electrical Manufacturer
2. C.B.M. - Certified Ballast Manufacturer
3. N.F.P.A. - National Fire Protection Association
4. E.T.L. - Electrical Testing Laboratories
5. State of Illinois Department of Transportation Standard Specifications for Traffic Control Items
6. I.P.C.E.A. - Insulated Power Cable Engineers Association
7. Standard Specifications - Standard Specifications for Road and Bridge Construction in the State of Illinois.
8. National Electrical Code
9. City of Rockford Building Code
10. City of Rockford Water Department Specifications
11. Technical Specifications for Sanitary Sewer Construction of the Sanitary District of Rockford

This shall not be construed as relieving the contractor from complying with any requirements of the plans and construction specifications which may be in excess of the requirements.

1.1.3 Construction Staking Complete

The Contractor shall be responsible for setting and staking all grades as indicated on the plan and cross sections. Any deviation from plans and grades without written authorization from the Engineer will not be accepted for payment until the Contractor has

corrected the construction to the satisfaction of the Engineer.

1.1.4 Maintenance of Traffic

The Contractor shall provide traffic control for the convenience and protection of vehicular and pedestrian traffic. Access to commercial or private driveways shall be maintained at all times for required access of private or commercial vehicles.

1.1.5 Saw Cutting

This work shall consist of sawing existing pavements when necessary to such a depth that when the pavement is removed a clean, neat edge will result with no spalling of the remaining pavement. Saw cutting shall be performed at all locations where pavement is removed and will be replaced.

1.1.6 Removal and Disposal of Unsuitable Materials

All excavated materials which are unsuitable for use in backfilling trenches around structures, or suitable materials excavated that are in excess of that required for backfilling and for constructing fills and embankments as shown on the Construction Drawings, shall be disposed of properly away from the job site.

1.1.7 Workmanship and Materials

- a. All materials to be provided by the contractor shall be new and of the best quality for the use intended. The quality of workmanship and materials entering into any and all of the items and the work included shall conform to pertinent sections, paragraphs, sentences and clauses, both directly and indirectly applicable thereto, contained in the latest Illinois Standard Specifications for Road and Bridge Construction, Illinois Department of Transportation. Whether or not direct reference to such specifications occurs in the description or specifications under each item.
- b. All equipment, materials, and workmanship shall be guaranteed by the contractor, supplier, and manufacturer for a period of one year from the date of acceptance of the equipment, workmanship or materials.

- c. It shall be the responsibility of the Contractor to protect the surface of the newly placed Asphalt from foreign marks and damage until a hard set has occurred. Any damaged surfaces shall be replaced to the direction of the Engineer at the expense of the Contractor.
- d. All concrete installed shall comply with Article 408.23 of the Standard Specifications, for Protective Coat application. This shall be considered incidental to the concrete items, and no compensation will be allowed.

1.1.8 Cooperation Among Subcontractors

It shall be the obligation of the contractor to ensure full cooperation among the subcontractors doing work on the project.

1.1.9 Weather

During freezing, stormy, or inclement weather all work shall be suspended except such as, in the Engineer's opinion, can be accomplished in an acceptable manner. Permission to work during such weather shall in no way be construed as a release of the contractor's responsibility regarding the quality of work executed at such time.

1.1.10 Final Inspection and Acceptance

The Contractor shall notify the Engineer when work is considered to be completed and ready for final inspection.

1.1.11 Construction Inspection

Any work performed without the presence of the Engineer to inspect said construction will not be accepted for payment. The Contractor shall notify the Engineer a minimum of 24 hours in advance of the start of construction or the continuation of construction following a pause in work.

1.1.12 Utility Coordination

It shall be the responsibility of the Contractor to cooperate and coordinate with the utilities in accordance with Article 107.26 of

the Standard Specifications. At least 48 hours before any excavation is planned, telephone (800) 892-0123 to have facilities located and marked.

The officials listed below shall be contacted for any necessary communication:

Brad Moberg	City Engineer	815-987-5579
Ken Theisen	USEPA	312-886-1959
Doug Wehner	IT Environmental Programs	800-372-3727
Stan Campbell	Jones and Neuse	504-767-5296
Raymond Boyd	IT Corporation	708-250-7788
Bob Nimmo	City Water	815-961-3785

1.1.13 Existing Utilities and Drainage Structures

The plans show existing utilities and drainage structures lying within the limits of the work under this contract such as gas and watermains, sewers, inlets, and buffalo boxes. The Department does not guarantee the completeness or accuracy of the information shown on the Construction Drawings regarding these utilities. Gas lines are not shown on the profiles but are typically located two (2) to four (4) feet below ground surface. The most likely location of encountering gas lines will be at street intersections. The contractor shall make his own investigation to verify or determine the existence, nature and location of all utilities on the site that may interfere with construction before starting his operations. The Contractor shall report to the Engineer any omissions or differences in location from that shown on the Construction Drawings. Care should be taken while working near these utilities to prevent their damage.

1.1.14 Requirements for Water Main Valve Shut Off

- a. With permission of the Department of Public Works Division water mains may be shut off from 9:00 a.m. until 3:00 p.m., and 11:00 p.m. until 6:00 a.m. only.
- b. Notification of Residents 24 hours in advance of water

shut off with forms supplied by the Water Division.

- c. Joint coordination between the Contractor and Engineer will be required to assure that each resident with water service has had water pressure restored after water has been turned on.
- d. The Contractor shall meet with Water Division personnel prior to start of construction to exercise valves and determine valve shut off pattern during construction. The Contractor shall then be responsible for turning valves on and off during construction and accepts the responsibility for any damages to valves during construction.

1.2 WATER MAIN SPECIFICATIONS

The following special provisions include changes from the City of Rockford Water Department-Water Main Specifications.

1.2.1 Main Locations

New water mains shall be located as shown in the Construction Drawings. Generally, water mains will be located at one edge of the existing road under the pavement.

1.2.2 Trench Depth

Trench depths shall be so as to provide a minimum of six (6) feet of backfill cover for the water mains. Trench depths of over 8 feet shall be avoided except where conflicts occur. Conflicts may include sewer lines, gas lines, storm drainage mains, and manholes.

1.2.3 Setting Valves

Valves in water mains shall be located as shown in the Construction Drawings.

1.2.4 Thrust Blocks

Thrust blocks are to be installed as needed at typical locations as indicated on the construction drawing details. Thrust blocks shall

be constructed of portland cement concrete.

1.2.5 Setting Hydrants

Hydrants shall be placed at every street intersection which in some cases is approximately 600 feet apart.

Hydrants shall be installed with the pumper nozzle facing directly toward the closest roadway.

Each hydrant shall be connected to the main by an eight (8) inch diameter branch line controlled by an independent eight (8) inch gate valve placed within 18 inches of the front of the hydrant.

1.2.6 Service Connections

The selected service connections are 3/4 inch seamless Type K copper tubing suitable for underground service, and conforming, with ASTM B-88-62 "Type K".

1.2.7 Backfill to Grade

Backfill shall be placed in eight (8) inch loose lifts and compacted to 95 percent of the maximum density as determined from a standard laboratory compaction test (ASTM D 698) up to the roadbase material. The roadbase shall be compacted to 95 percent of modified laboratory compaction (ASTM 1557).

1.3 FERROUS PIPE

The following special provisions include changes from the City of Rockford Water Department Specifications, Division II - Water Distribution Materials for Ferrous pipe.

1.3.1 Thickness Class

Thickness classes of concern will be the six (6) inch, eight (8) inch, and twelve (12) inch nominal size pipe.

1.3.2 Lining

All pipe shall have bituminous coating in addition to being cement mortar lined.

1.4 Fire Hydrant W/8" Valve and Vault

Fire hydrants shall consist of furnishing and installing in accordance with the City of Rockford Water Division requirements and standards herein.

New manholes shall be in accordance with Article 612 of the Standard Specifications and as detailed on the drawings. Castings shall be Neenah No. R-1760 (total weight 350 pounds) with standard non-rocking covers or approved equal, shown on Standard 65a.

This item includes furnishing and installing precast bases, brick and mortar (or precast wall sections), manhole steps and manhole frames and covers; furnishing all concrete classed shown on the plans, and forming channels through the manholes, any necessary excavation for widening and deepening of trenches.

Valves shall be furnished and installed in accordance with the City of Rockford Water Division specifications and the requirements of the Engineer. The contractor shall contact the Water Division Superintendent for approval of grade, type, and style of valves and fittings required to complete installation prior to bidding, ordering, or placing.

Carrier Pipe

All watermain and fittings used in conjunction with the casing shall be 250 PSI rated ductile iron and fully comply with provisions of AWWA standard C-110-71 (ANSI standard - A21.11-1972).

All joints shall be mechanical joint type and shall fully comply with the provisions of AWWA standard C111-72 (ANSI standard - A21.11-1972).

2.0 CITY OF ROCKFORD
WATER DEPARTMENT
WATER MAIN SPECIFICATIONS - REVISED

1. GENERAL

Water mains, service connections and appurtenances shall be constructed in accordance with American Water Works Association Standard C600-82 as amended herein. Subjects not governed by the above shall be governed by the pertinent provisions of the following, listed in order of precedence:

- a. Great Lakes - Upper Mississippi River Board of State Sanitary Engineers Recommended Standards for Water Works, 1982 Edition.
- b. Standard Specifications for Water and Sewer Main Construction in Illinois, May 1986 Edition.

2. MATERIALS

Materials shall comply with the provisions of "Rockford Water Department Specifications, Division II - Water Distribution Materials", which by this reference are made part of these specifications the same as if contained fully herein.

3. MAIN LOCATION

Water mains shall, in general, be located between the curb and sidewalk. Preferred locations are as shown on the Construction Drawings. Water mains parallel to curbs shall be located at least two (2) feet from the back of the curb.

4. TRENCH DEPTH

Trenches shall be excavated to a depth sufficient to provide a minimum of six (6) feet of cover measured from the top of the pipe to the finished grade. Trench depth shall be increased where necessary so that the main is installed on a uniform gradient, despite minor local variations in surface grade.

5. JOINTS

All ferrous pipe joints shall be of the slip-on or mechanical joint types as provided in the material specifications cited above. All mechanical joints shall be made with ductile iron retainer glands; all valves and fittings shall have mechanical joints.

6. SETTING VALVES

Valves in water mains shall be located on right-of-way lines extended or lot lines extended as shown on the Construction Drawings.

Valves up to ten (10) inches in size shall be gate valves. Valves larger than ten (10) inches in size shall be butterfly valves.

A masonry valve vault shall be provided for every valve. The valve operating nut shall be readily accessible for operation through the manhole opening which shall be set flush with the finished surface. Vaults shall be so constructed as to permit minor valve repairs and to afford protection to the valve and to the pipe where it passes through the vault walls.

Valve vaults shall be constructed of concrete block, concrete brick laid up in alternate courses of headers and stretchers, or precast concrete, placed upon a concrete foundation ring six (6) inches thick with a minimum diameter of four (4) feet. Concrete block or brick shall be set in mortar with the vertical joints broken to provide drainage. The cone of the vault shall be no more than 36 inches in height and at grade shall accept the manhole rim and cover specified below.

Manhole rims and covers shall be of light construction when located outside of paved surfaces; of heavy construction when located in paved surfaces; and of extra heavy construction when located in paved surfaces designated by the City as major arterial streets.

7. DEAD ENDS

All dead ends on new mains shall be closed with cast iron plugs or caps. Where a dead end is not equipped with a fire hydrant, the last pipe shall be fitted with a bleeder plug and valve. The valve shall be a two (2) inch corporation stop. The bleeder valve shall be located in a bleeder vault which shall be a temporary structure three (3) feet in diameter with no foundation ring but otherwise constructed in the manner of a valve vault.

In order to reduce cost and allow future main extensions to be made without interruption of water service, extensions should, where possible, end one (1) pipe length beyond a control valve. The stub end must be capped but the bleeder valve may be located in the control valve vault, provided no service connections are made to the stub.

8. SETTING HYDRANTS

Hydrants shall be located as shown on the plans or as otherwise directed so as to provide complete accessibility and minimize the possibility of damage from vehicles or injury to pedestrians. One hydrant shall be set at each street intersection. Intermediate hydrants shall be set so that hydrants are no more than 300 feet apart in commercial/industrial developments or 500 feet apart in residential developments.

All hydrants shall stand plumb and shall have their nozzles parallel with or at right angles to the curb, with the pumper nozzle facing the curb. No portion of the pumper or hose nozzle cap shall be less than 24 inches from the gutter face of the curb. Hydrants shall be set to the finished grade, with all nozzles at least 18 inches above the finished grade.

Each hydrant shall be connected to the main by a six (6) inch diameter branch line controlled by an independent six (6) inch gate valve placed within 18 inches in front of the hydrant.

Each hydrant shall be placed upon a two (2) foot square concrete base set upon undisturbed soil. The hydrant shall be braced until the vault is built and the backfill made.

Each hydrant shall be provided with a hydrant vault constructed in the manner previously specified for valve vaults except that it shall be larger in diameter at the bottom to accommodate the hydrant branch valve and the base of the hydrant. The neck of the vault shall be drawn toward the main where a manhole rim and cover shall be installed.

9. SERVICE CONNECTIONS

Service connection sizes shall be approved by the City. Service branch pipes two (2) inches in diameter and smaller shall be copper. Service branch pipes larger than two (2) inches shall be ductile iron.

Each service shall be provided with a valve at the point of connection with the main. For copper services the valve at the main shall be a corporation stop; for iron services, a distribution gate valve. Corporation stops shall be buried. Gate valves shall be provided with a valve vault.

The table below lists the largest service sizes that may be directly tapped into the main for each size of main.

<u>Main Size</u>	<u>Largest Direct Tap</u>
4 inch	3/4 inch
6 inch	1 inch
8 inch	1-1/2 inch
10 inch	2 inch
12 inch	2 inch
16 inch	2 inch

Service connections larger than those listed above shall be made using service clamps.

Each copper service shall be provided with a curb stop valve and box located between the sidewalk and property line. The curb stop valve shall not be located beneath any sidewalk or driveway.

10. HYDROSTATIC TESTING

All newly laid pipe, or valved sections thereof, shall be subject to a hydrostatic pressure of 100 pounds per square inch gauge (100 PSIG) based on the elevation of the highest point along the test section and corrected to the elevation of the test gauge. The duration of each pressure test shall be not less than two (2) hours.

Each valved section of pipe shall be slowly filled with water and the specified test pressure applied. Before applying the specified test pressure, all air shall be expelled completely from the pipe, valves and hydrants. The contractor shall install corporation stops at all points located at a higher elevation than the immediately adjacent sections of main so that air can be expelled as the line is filled with water. After the air has been expelled, the corporation stops shall be closed and test pressure applied.

After test pressure has been reached and the system allowed to stabilize, not more than plus or minus five pounds per square inch gauge (\pm 5 PSIG) deviation will be allowed for the duration of the test.

All exposed pipes, fittings, valves, hydrants and joints shall be carefully examined. All joints showing visible leaks shall be repaired by the contractor. Any cracked or defective pipe, fittings, valves, or hydrants discovered in consequence of the pressure test shall be removed and replaced by the contractor. The test shall be repeated until satisfactory to the City.

A leakage test shall be conducted after the pressure test has been satisfactorily completed. Leakage shall be defined as the quantity

of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within five pounds per square inch (5 PSI). Leakage shall not be measured by a drop in pressure in a test section over a period of time.

No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{(N)(D) \sqrt{P}}{3700}$$

in which L is the allowable leakage, in gallons per hour; S is the length of pipe tested, in feet; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in pounds per square inch gauge.

JOB NO. _____

ROCKFORD WATER DEPARTMENT
LEAKAGE TEST RESULTS

Date _____ Subdivision _____

Inspector _____ Contractor _____

$$\text{Formula: } L = \frac{(N)(D) \sqrt{P}}{3700}$$

L = Leakage in gallons per hour
N = Number of joints (excluding service connections)
D = Pipe diameter in inches
P = Test Pressure (100 PSI minimum)

ALLOWABLE LEAKAGE: L = _____ gals./hr.

TEST RESULTS: L = _____ gals./hr.

PROCEDURE

1. Slowly fill watermain, expelling air at the highest point.
2. Corporation stop used for test procedures should be at the highest elevation otherwise 0.433 PSI/ft. differential must be added to the 100 PSI minimum test pressure.
3. After test pressure has been reached, start two (2) hour timing period.
4. During two (2) hour test, periodically repressurize remaining system pressure back to original test pressure.
5. Note original water mark and amount of draw down on final repressurization at the end of two (2) hour test.
6. Measure the amount of water lost compared to allowable leakage.

$$\text{ALLOWABLE LEAKAGE: } L = \frac{(N)(D)\sqrt{P}}{3700}$$

L = Leakage (gals./hr.)

N = Number of joints

D = Pipe diameter in inches

P = Test pressure (100 PSI minimum)

EXAMPLE

	<u>No. of Joints</u>
2500 - Feet of 8 inch pipe	126
7 - Hydrants including gate valves and tees	42
11 - Watermain gate valves	22
3 - 8 x 8 tees	9
2 - 1/4" bends	4
2 - 8 inch solid sleeves	4
1 - 6 inch service*	4
Total	<u>211</u>

*NOTE -

Only service larger than 2 inches to be included in leakage formula.

$$L = \frac{(211)(8)(\sqrt{100})}{3700}$$

$$= \frac{16800}{3700}$$

ALLOWABLE LEAKAGE: = 4.56 gal./hr.**

TEST RESULTS: L = _____ gal./hr.

**NOTE:

No watermain installation will be accepted if the leakage is greater than that determined by the formula.

11. BACKFILL BELOW PIPE CENTERLINE

All trenches shall be backfilled, from the bottom of the trench to the centerline of the pipe, with granular backfill or approved native material. The backfill material shall be deposited in the trench for its full width on each side of the pipe simultaneously, distributed evenly by hand, and compacted by tamping.

12. BACKFILL OVER PIPE

All trenches shall be backfilled, from the centerline of the pipe to a depth of one (1) foot above the top of the pipe, with granular backfill or approved native material compacted by tamping. The contractor shall use special care in placing this portion of the backfill so as to avoid injuring or moving the pipes.

13. BACKFILL TO GRADE

When the type of backfill material is not indicated in the plans or elsewhere specified, the trench shall be backfilled, from one (1) foot above the pipe to the finished grade, with native material or other materials approved by the City in twelve (12) inch layers compacted by tamping.

14. BACKFILL UNDER PAVEMENT

Where the excavation is made through or within two (2) feet of permanent pavements, curbs, driveways, or sidewalks, or where such structures are undercut by the excavation, or where such structures may reasonably be expected to be constructed over or within 2 feet of the excavation within one (1) year after backfilling, the entire backfill to the subgrade of the structures shall be made with granular material compacted by tamping. When granular backfill is required under pavements, curbs, driveways, or sidewalks planned to be constructed within 1 year after backfilling, the areas requiring such granular backfill shall be indicated in the plans.

15. DISINFECTION

After the backfill has been completely made, the contractor shall

disinfect the pipeline in compliance with the provisions of American Water Works Association Standard C601-81 and the provisions herein specified.

Prior to disinfection, the pipeline or valved section thereof, shall be flushed at a minimum flow velocity of two and one-half (2-1/2) feet per second. Following full development of flow, flushing shall continue until the discharge runs clear or until the City shall direct flushing operations to cease. In no event shall the duration of flushing be less than ten (10) minutes. Water used in flushing the pipeline shall be introduced into the pipeline at a point of connection with the existing distribution system designated by the City.

After flushing the Continuous Feed Method described in AWWA C601-81 shall be used to disinfect the pipeline or valved section thereof. Water used in disinfecting the pipeline shall be introduced into the pipeline through the pressure test connection made under the provisions of Section 8 above.

Bacteriological samples shall be collected from the pipeline on two (2) successive days following disinfection and final flushing. All samples shall be collected by the City and transported to the Winnebago County Health Department laboratory for analysis. If either sample shows the presence of coliform organisms, the contractor shall repeat the disinfection procedure.

If valved sections of the pipeline are disinfected separately, each such section shall be considered a separate pipeline for disinfection and flushing until disinfection of the upstream section has been satisfactorily completed as determined by bacteriological analysis.

16. MISCELLANEOUS FITTINGS AND CONNECTING TO EXISTING MAIN

All fittings, i.e. elbows, reducers, tees, crosses, sleeves,

offsets and bends will not be paid for separately. These items shall be included in the various bid items found in the non-participating items schedule.

**3.0 ROCKFORD WATER DEPARTMENT SPECIFICATIONS
DIVISION II - WATER DISTRIBUTION MATERIALS
SECTION 10 - GENERAL**

10.1 SCOPE

These specifications cover the pipe, fittings, valves, and accessories normally used in the construction of water piping and distribution systems.

All materials shall be new and of prime quality.

10.2 REVISIONS OF CITED STANDARDS

References made herein to published standards shall refer to the editions or revisions in effect on the date of the specification, except that when such standard includes in its designation an edition or revision number the edition or revision cited shall govern.

10.3 DATA AND DRAWINGS

All of the data requested on the bid forms or in the specifications and all of the drawings requested in the same must be included with the bid. Failure to provide any required data or drawings will result in rejection of the bid as incomplete.

10.4 CERTIFICATES OF COMPLIANCE

Certificates of compliance with these specifications shall be provided for all materials bid. Failure to conform to these specifications or failure to provide the required certification shall be cause for rejection of a bid.

10.5 FREIGHT CHARGES

All prices shall be bid F.O.B. Rockford Water Department.

**4.0 ROCKFORD WATER DEPARTMENT SPECIFICATIONS
DIVISION II - WATER DISTRIBUTION MATERIALS
SECTION 11 - FERROUS PIPE**

11.1 TYPE

All ferrous pipe shall be centrifugally cast ductile iron and shall fully comply with the provisions of AWWA Standard C151-76 (ANSI Standard A21.51-1976).

11.2 THICKNESS CLASS

The thickness class, minimum wall thickness and maximum bury for each size of pipe shall be as follows for regular service:

<u>Nominal Size</u> <u>(inch)</u>	<u>Thickness</u> <u>Class</u>	<u>Wall Thickness</u> <u>(inches)</u>	<u>Maximum Bury</u> <u>(feet)</u>
4	52	0.29	--
6	52	0.31	--
8	52	0.33	--
10	52	0.35	--
12	52	0.37	28
16	51	0.37	16
20	51	0.39	12
24	51	0.41	10

11.3 LINING

All pipe shall be cement mortar lined, and such lining shall fully comply with the provisions of AWWA Standard C104-80 (ANSI Standard A21.4-80).

11.4 JOINTS

All joints shall fully comply with the provisions of AWWA Standard C111-72 (ANSI Standard A21.11-1972). Pipe shall be furnished complete with joint accessories.

11.5 ELECTRICAL CONTINUITY

All pipe shall be supplied with provision to ensure positive electrical continuity between pipe sections. Such continuity provision shall be adequate to carry 1000 amps without damage to the pipe or gasket.

11.6 LAYING LENGTH

Pipe shall be furnished in twenty (20) foot nominal laying lengths.

**5.0 ROCKFORD WATER DEPARTMENT SPECIFICATIONS
DIVISION II - WATER DISTRIBUTION MATERIALS
SECTION 12 - FERROUS PIPE FITTINGS**

12.1 TYPE

Ferrous pipe fittings shall be 250 PSI rated cast iron or ductile iron and fully comply with the provisions of AWWA Standard C110-82 (ANSI Standard A21.10-82).

12.2 LINING

All fittings shall be cement mortar lined in compliance with the provisions of AWWA Standard C104-80 (ANSI Standard A21.4-80), or bituminous lined in compliance with AWWA Standard C110-82 (ANSI Standard A21.10-82).

12.3 JOINTS

All joints shall fully comply with the provisions of AWWA Standard C111-72 (ANSI Standard A21.11-1972), or with AWWA Standard C115-75 (ANSI Standard A21.15-1975), as applicable to the joint type specified.

Fittings shall be furnished complete with joint accessories. Mechanical joint fittings shall be furnished with ductile iron retainer glands (RWDS-21-1979).

**6.0 ROCKFORD WATER DEPARTMENT SPECIFICATIONS
DIVISION II - WATER DISTRIBUTION MATERIALS
SECTION 13 - DISTRIBUTION GATE VALVES**

13.1 TYPE

Gate Valves shall be iron-body, bronze-mounted, nonrising stem, double disc gate valves with parallel seats or resilient seat wedge type, opening left, and shall fully comply with the provisions of AWWA Standard C500-86 for double disc type and C509-87 for resilient seat type.

13.2 STEM SEALS

Gate Valves shall be furnished with O-ring stem seals.

13.3 JOINTS

All joints shall be mechanical joint type and shall fully comply with all provisions of AWWA Standard C111-85.

13.4 SHOP DRAWINGS

A complete shop drawing shall be provided for every type of valve supplied, showing the name, part number and material of construction for every part of the valve.

13.5 APPROVED VALVES

The following manufacturers are listed as offering valves in essential compliance with these specifications. Responsibility rests with the supplier for demonstrating that a particular valve model complies fully with these specifications. Manufacturers other than those listed may be acceptable provided the supplier can satisfy the City that these specifications are met.

1. Mueller Company, Decatur, Illinois
2. Clow Corporation, Bettendorf, Iowa
3. American - Darling Valve, Birmingham, Alabama
4. Kennedy Valve, Elmira, New York
5. Dresser M & H, Anniston, Alabama

13.6 JOINT ACCESSORIES

Valves shall be furnished complete with mechanical joint accessories.

**7.0 ROCKFORD WATER DEPARTMENT SPECIFICATIONS
DIVISION II - WATER DISTRIBUTION MATERIALS
SECTION 14 - DISTRIBUTION BUTTERFLY VALVES**

14.1 GENERAL

Butterfly valves shall be of the rubber seated type in full compliance with the provisions of AWWA Standard C504-80. In addition, the following special requirements shall prevail over the general provisions of the above referenced standard.

14.2 CLASS

Butterfly valves shall be class 150B as designated in AWWA Standard C504-74.

14.3 BODIES

Valve bodies shall be of cast iron conforming to ASTM A-126 class B or of ductile iron conforming to ASTM A-536 grade 65-45-12. Valve ends shall be of the mechanical joint type and shall be integral with the bodies.

14.4 DISCS

Valve discs shall be of the offset shaft type so as to provide a full uninterrupted 360 degree sealing surface. Discs shall be streamlined and present the smallest profile consistent with the structural requirements of the valve class. Valve discs shall be constructed of ductile iron conforming to ASTM A-536 grade 65-45-12.

14.5 SEATS

Valve seats shall be of "Buna-N" rubber. Seats mounted on the disc shall be clamped thereon. Seats mounted in valve bodies shall be cemented and clamped or bonded to the valve body. Seat clamps shall be of stainless steel with stainless steel fasteners. Seats shall mate with a continuous 360 degree sealing surface of 18-8 stainless steel.

**8.0 ROCKFORD WATER DEPARTMENT SPECIFICATIONS
DIVISION II - WATER DISTRIBUTION MATERIALS
SECTION 15 - FIRE HYDRANTS**

15.1 GENERAL

Fire hydrants shall fully comply with all of the general provisions of AWWA Standard C502-85 and with the special requirements hereinafter provided.

15.2 INLET

The inlet connection shall be six (6) inch standard mechanical joint. Shoe interior and lower valve plate shall be epoxy coated.

15.3 MAIN VALVE

The main valve shall be five and one-quarter (5-1/4) inches in size, closing with the water pressure. Main valve shall be made of rubber with resiliency to provide tight closure without using excessive force. The upper valve plate and seat ring shall both be of solid, one-piece bronze construction, and the seat ring shall attach to the hydrant shoe by threading into a bronze fitting. The main valve assembly shall include provision to restrain movement of the main valve and stem in any direction other than parallel to the axis of the stem.

15.4 BARREL DRAIN

The barrel shall be provided with drain holes controlled by a drain valve assembly. The drain valve shall be positively controlled by the position of the hydrant operating nut; shall drain the hydrant barrel when the main valve is closed, shall permit the drain holes to be flushed under pressure, and shall close the drain holes when the main valve is opened to the normal operating position.

15.5 BARREL

Barrel length shall be based on six (6) foot bury (trench) depth. Barrel and stem extensions shall be available in six (6) inch lengths and longer lengths in increments of six (6) inches. The main valve size shall be cast in the barrel of the hydrant.

15.6 OUTLETS

Hydrants shall be bid with the following outlet specifications:

One (1) four (4) inch pumper nozzle, 5.019⁰ inch ODM, 4 T.P.I. (NHT); and two (2) two and one-half (2-1/2) inch hose nozzles, 3.0686 inch ODM, 7-1/2 T.P.I. (NHT)

Nozzles shall be fastened mechanically into the upper barrel and have nozzle caps chained to the upper barrel. Leaded in nozzles shall not be allowed.

15.7 LUBRICATION

Hydrants shall be of the "dry top" type, with the stem thread fully immersed in an all temperature petroleum lubricant. The lubricant shall retain stable viscosity and lubricity at temperatures down to -30 degrees F. The lubricant reservoir shall be equipped with "O-ring" seals.

15.8 OPERATOR

The operating nut shall be one (1) inch square at the base, tapering to seven-eighths (7/8) inch, and shall turn to the right (clockwise) to open.

15.9 PAINTING

Painting and coating shall be in accordance with AWWA Standard C502-80, with a finish coat of traffic yellow starting six (6) inches below the flange and above.

15.10 TRAFFIC BARREL

In addition to the above requirements, hydrants shall be of the "break away" barrel and stem design. Traffic break away design shall allow for 360 degree facing of nozzles by infinite degree. Safety stem coupling shall be of frangible design which will provide a clean break or tear into two halves upon impact. Safety stem couplings shall be secured to the stem with stainless steel

pins and fasteners.

15.11 SHOP DRAWING

A complete shop drawing shall be provided for every type of hydrant offered, showing the name, part number, and material of construction for every part of the hydrant.

15.12 PERFORMANCE CURVE

A certified performance curve shall be provided for every type of hydrant offered, showing the pressure loss through the hydrant as a function of discharge rate from zero to at least 1,000 gallons per minute. Hydrants shall be rated for 200 PSI working pressure and 400 PSI test pressure. Friction loss through the pumper nozzle shall not exceed 4.25 PSI when tested in accordance with AWWA Standard C-502.

15.13 SPECIAL CONSIDERATIONS

The City is particularly concerned with reliability of operation, especially in cold weather, and with pressure losses through the hydrant. Suppliers are directed to address these considerations as they will be used in the selection and/or approval of hydrants.

15.14 APPROVED HYDRANTS

The following manufacturers are listed as offering hydrants in essential compliance with these specifications. Responsibility rests with the supplier for demonstrating that a particular hydrant model complies fully with these specifications. Manufacturers other than those listed may be acceptable, and will be given full consideration, provided the supplier can satisfy the City that these specifications are met.

1. Mueller Company, "Super Centurion"
2. Clow Corporation, "Medallion"

**9.0 ROCKFORD WATER DEPARTMENT SPECIFICATIONS
DIVISION II - WATER DISTRIBUTION MATERIALS
SECTION 16 - MANHOLE CASTINGS**

16.1 MATERIAL

Castings shall be manufactured of cast iron conforming to ASTM A-48-74 class 30 or ductile iron conforming to ASTM A-536-72 grade 60-40-18.

16.2 BEARING SURFACES

Both the rim and cover shall be machined both vertically and horizontally so that there will be no variation from a circular, straight edge.

16.3 WEIGHT PATTERNS

Castings shall be supplied in three (3) weight patterns as follows:

- a. Light. Frame and cover weighing approximately 160 pounds complete.
- b. Heavy. Frame and cover weighing approximately 285 pounds complete.
- c. Extra-heavy. Frame and cover weighing approximately 540 pounds complete.

The design of each casting is the Water Department's own, and is shown on the attached drawings. All castings must conform with the dimensions given thereon in order to ensure interchangeability with existing castings.

16.4 COVER PATTERN

Covers shall be supplied with a checkered pattern top lettered "water".

10.0 ROCKFORD WATER DEPARTMENT SPECIFICATIONS
DIVISION II - WATER DISTRIBUTION MATERIALS
SECTION 17 - COPPER TUBING

17.1 TYPE

Tubing shall be seamless Type K copper tubing, suitable for underground service, and conforming with ASTM B-88-62 "Type K".

17.2 SIZES

Tubing shall be supplied in the following Standard Water tube sizes:

- a. 3/4 inch
- b. 1 inch
- c. 1-1/4 inch
- d. 1-1/2 inch
- e. 2 inch

17.3 SHIPPING PACKAGES

- a. Three-quarter (3/4) inch and one (1) inch tubing shall be supplied in sixty (60) foot rolls.
- b. One and one-quarter (1-1/4) inch, one and one-half (1-1/2) inch, and two (2) inch tubing shall be supplied in twenty (20) foot straight lengths, adequately packaged to protect the tubing.

11.0 ROCKFORD WATER DEPARTMENT SPECIFICATIONS
DIVISION II - WATER DISTRIBUTION MATERIALS
SECTION 18 - CURB STOP BOXES

18.1 GENERAL

Curb stop boxes shall be extension type, with arch pattern bases, for six (6) foot trench depth. Upper sections shall be of steel and shall telescope a minimum of twelve (12) inches. Provision shall be made to prevent the upper sections from turning or from pulling out of the base sections.

18.2 DIMENSIONS

Upper sections for three-quarters (3/4) inch and one (1) inch curb stop boxes shall be one (1) inch size. Upper sections for one and one-half (1-1/2) inch and two (2) inch curb stop boxes shall be one (1) inch or one and one-quarter (1-1/4) inch size. The base sections shall be adequately sized to accommodate Mueller Oriseal pattern curb stops.

18.3 STATIONARY RODS

Stationary rods thirty-six (36) inches long shall be furnished with curb stop boxes. Rod design shall center the upper end of the rod in the upper box section.

18.4 LIDS

Lids shall be furnished with curb stop boxes. Lids shall have brass bushings iron pipe threaded, and shall be cast with lettering to indicate a water service valve.

18.5 COATING

Curb stop boxes shall be coated, inside and outside, with coal tar enamel. Stationary rods and lids shall also be coated with coal tar enamel.

18.6 APPROVED CURB STOP BOXES

The following manufacturers are listed as offering curb stop boxes complying with these specifications:

<u>Stop Size</u>	<u>Manufacturer</u>	<u>Box Number</u>	<u>Lid Number</u>
3/4 and 1	A. Y. McDonald	5601	5601-L
1-1/2 and 2	Mueller	H-10386	

Other manufacturers may be acceptable provided the supplier can satisfy the City that these specifications are met.

**12.0 ROCKFORD WATER DEPARTMENT SPECIFICATIONS
DIVISION II - WATER DISTRIBUTION MATERIALS
SECTION 19 - CORPORATION STOP VALVES**

19.1 GENERAL

Corporation stop valves shall be manufactured of waterworks bronze (ASTM B62), with full diameter stop orifice, and thread patterns conforming to AWWA Standard C800-66 figures 1 and 2 for type K copper service tube.

19.2 PATTERN

Design and dimension of corporation stops must conform with Mueller H-15000 stops to allow use in the City's tapping machines.

19.3 SIZES

Corporation stop valves shall be furnished in three-quarters (3/4) inch, one (1) inch, one and one-quarter (1-1/4) inch, one and one-half (1-1/2) inch, and two (2) inch sizes for use with Type K copper tubing in the same Standard Water Tube sizes.

19.5 JOINTS

Corporation stop valves shall be furnished with either flare type joints or compression joints complying with Section 22 of these specifications.

**13.0 ROCKFORD WATER DEPARTMENT SPECIFICATIONS
DIVISION II - WATER DISTRIBUTION MATERIALS
SECTION 20 - CURB STOP VALVES**

20.1 GENERAL

Curb stop valves shall be manufactured of waterworks bronze (ASTM B62), with full round stop orifices, and 360 degree stop rotation. Tee heads must be designed for connection to curb box stationary rods similar to A. Y. McDonald #5664 rods.

20.2 TYPES

Curb stop valves shall be ball or O-ring seal types. Solid head and inverted key curb stop valves are not acceptable.

20.3 SIZES

Curb stop valves shall be furnished in three-quarters (3/4) inch, one (1) inch, one and one-quarter (1-1/4) inch, one and one-half (1-1/2) inch, and two (2) inch sizes for use with Type K copper tubing in the same Standard water Tube sizes.

20.4 JOINTS

Copper joints on curb stop valves shall be either flare type joints or compression joints complying with Section 22 of these specifications.

14.0 ROCKFORD WATER DEPARTMENT SPECIFICATIONS
DIVISION II - WATER DISTRIBUTION MATERIALS
SECTION 21 - DUCTILE IRON RETAINER GLANDS

21.1 GENERAL

This specification covers retainer type glands used to restrain mechanical pipe joints.

21.2 CONSTRUCTION

Retainer glands shall be cast from ductile iron and machined to the dimensions and/or tolerances hereinafter specified either directly or by reference.

21.3 DESIGN

Retainer glands shall be designed for use in place of the standard glands for AWWA Standard C111-72 (ANSI Standard A21.1-1972) mechanical joints. In addition, retainer glands shall include set screws which shall restrain the plain pipe end and prevent joint separation at pressures up to 200 PSIG. A sufficient number of set screws shall be provided so that full joint strength shall be achieved with set screw torque not to exceed 80 foot-pounds.

21.4 SET SCREWS

Set screws shall be made from corrosion resistant material as similar as practicable in chemical composition to the gland material. Set screws shall be furnished with cup points.

21.5 COATING

Retainer glands shall be furnished factory coated with bituminous material meeting the requirements for outside coatings of AWWA Standard C151-76 (ANSI Standard A21.51-1976).

**15.0 ROCKFORD WATER DEPARTMENT SPECIFICATIONS
DIVISION II - WATER DISTRIBUTION MATERIALS
SECTION 22 - COPPER COMPRESSION JOINTS**

22.1 GENERAL

This specification covers compression type joints for copper service pipe and fittings.

22.2 DEFINITION

Compression joint is hereby defined to be a joint whereby plain end copper tubing is connected to a fitting and locked into place by compressive forces created when a nut threaded onto the body of the fitting is tightened. A compression joint shall require no preparation of the end of the tubing other than simple cleaning.

22.3 COMPONENTS

A compression joint shall consist of:

- a. a receptacle in the fitting body for the end of the copper tubing, the outside of which receptacle shall be threaded to accept the coupling nut; and
- b. a gasket which shall provide the hydraulic seal for the joint and transmit the compressive forces to the gripper band; and
- c. a gripper band which shall produce circumferential indentations in the tubing, thereby restraining the tubing and preventing joint separation; and
- d. a coupling nut which shall thread onto the body of the fitting and, upon tightening, compress the gasket and gripper band; and
- e. a device or means of providing positive electrical continuity through the joint.

22.4 GASKET

The gasket shall be made of a synthetic rubber material capable of providing a watertight seal when installed at temperatures ranging from -20 degrees F to +100 degrees F. It shall be capable of maintaining a watertight seal through repeated temperature cycles between 32 degrees F and 80 degrees F, and shall be undamaged by

water temperatures up to 160 degrees F. The gasket shall be totally confined by the fitting body/coupling nut assembly.

22.5 GRIPPER BAND

The gripper band shall be made from corrosion resistant steel. It shall be concave in shape so as to produce two parallel circumferential indentations in the tubing, and shall overlap itself upon compression.

22.6 COUPLING NUT

The coupling nut shall be made of waterworks bronze (ASTM B-62).

22.7 TOLERANCES

The fitting body receptacle and coupling nut eye shall be manufactured to a close tolerance to Type K copper water tube, so that the tubing cannot be inserted into the coupling assembly unless the tubing is truly round in cross section and axially straight.

22.8 ELECTRICAL CONTINUITY

Compression couplings shall include provision for positive electrical connection between the tubing and the fitting body. The electrical connection shall be adequate to conduct 200 amps without damage to the gasket or any other part of the joint.

22.9 JOINT STRENGTH

Compression coupling joints shall not pull apart at loads less than 2,000 pounds.

22.10 APPROVED COUPLINGS

The following manufacturers are listed as offering compression couplings in essential compliance with these specifications. Responsibility rests with the supplier to demonstrate that a particular coupling model complies fully with these specifications. Manufacturers other than those listed may be acceptable, and will

be given full consideration, provided the supplier can satisfy the City that these specifications are met:

1. MUELLER COMPANY, Decatur, Illinois
2. A. Y. MCDONALD MFG. COMPANY, Dubuque, Iowa

**16.0 ROCKFORD WATER DEPARTMENT SPECIFICATIONS
DIVISION II - WATER DISTRIBUTION MATERIALS
SECTION 23 - TAPPING GATE VALVES**

23.1 TYPE

Tapping gate valves shall be iron-bodied, bronze-mounted, non-rising stem, double disc gate valves with parallel seals or resilient seat wedge type, opening left, and shall fully comply with the provisions of AWWA Standard C500-86 for double disc type and C509-87 for resilient seat type.

23.2 STEM SEALS

Valves shall be furnished with O-ring stem seals.

23.3 SEAT OPENING

Seat openings shall be larger than the nominal size of the valve by an amount sufficient to pass a full-diameter cutter.

23.4 JOINTS

Valves shall be furnished with standard AWWA mechanical joint outlet ends complete with accessories. A ductile iron retainer gland (RWDS-21-1979) shall be furnished.

23.5 SHOP DRAWINGS

A complete shop drawing shall be provided for every type of valve supplied, showing the name, part number, and material of construction for every part of the valve.

23.6 COMPATIBILITY

The supplier shall provide a list of those tapping sleeves with which his valves are compatible, including those sleeves manufactured by others.

23.7 APPROVED VALVES

The following manufacturers are listed as offering valves in essential compliance with these specifications. Responsibility rests with the supplier for demonstrating that a particular valve

model complies fully with these specifications. Manufacturers other than those listed may be acceptable provided the supplier can satisfy the City that these specifications are met:

1. MUELLER CO., Decatur, Illinois
2. KENNEDY VALVE, Elmira, N. Y.
3. CLOW CORP., Bettendorf, IA
4. AMERICAN - DARLING VALVE, Birmingham, AL
5. DRESSER M & H, Anniston, AL

**17.0 ROCKFORD WATER DEPARTMENT SPECIFICATIONS
DIVISION II - WATER DISTRIBUTION MATERIALS
SECTION 24 - SERVICE FITTINGS**

24.1 MATERIAL

Service fittings shall be manufactured of waterworks bronze (ASTM B62).

24.2 SIZES

Service fittings shall be furnished in three-quarters (3/4) inch, one (1) inch, one and one-quarter (1-1/4) inch, one and one-half (1-1/2) inch, and two (2) inch sizes for use with Type K copper tubing in the same Standard Water Tube sizes.

24.3 JOINTS

Copper joints on service fittings shall be furnished with either flare type joints or with compression joints complying with Section 22 of these specifications.

ATTACHMENT II

IT CORPORATION STATEMENT OF WORK - REFERENCE TO
PLUMBING CODES

INTERNATIONAL TECHNOLOGY CORPORATION

EXHIBIT I

STATEMENT OF WORK

The Subcontractor, as an independent contractor and not as an agent of IT Environmental Programs (ITEP), shall furnish necessary personnel, materials, services, equipment, and facilities and otherwise do all things necessary for, or incident to perform the following work:

- Connect new water service from the curb box to existing housing service lines, according to applicable plumbing codes and specifications.
- Initiate hydrostatic pressure testing of water service lines.
- Disconnect the existing private well connection to housing service line.
- Coordinate with water division of City of Rockford for water meter installation.
- Backfill trenching to existing grade and rough rake the surrounding work area.

The addresses for which and a diagram of the typical lot service are included herein as Addendum I to the Scope of Work.

Within seven days after receipt of the notice to proceed, Subcontractor shall submit to ITEP for review, an updated estimated progress schedule indicating the starting and completion dates of the various stages of the work, and a preliminary schedule of Shop Drawing submissions and other specified schedules.

Reference Standards

Reference to the standards of any technical society, organization, or association, or to codes of local or state authorities, shall mean the latest standard, code specification, or tentative standard adopted and published at the date receipt of bids, unless specifically stated otherwise. The subcontractor shall meet all plumbing codes, regulations, and standards issued in Illinois Department of Public Health, Plumbing Code, edition 1986 and City of Rockford, Water Department Specifications, current issue.

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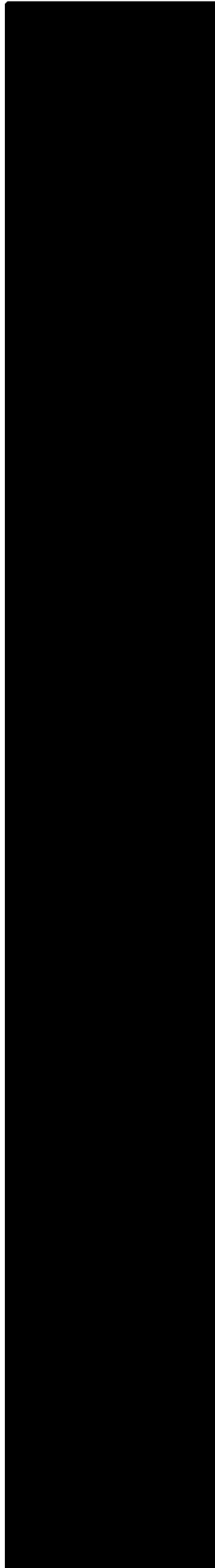
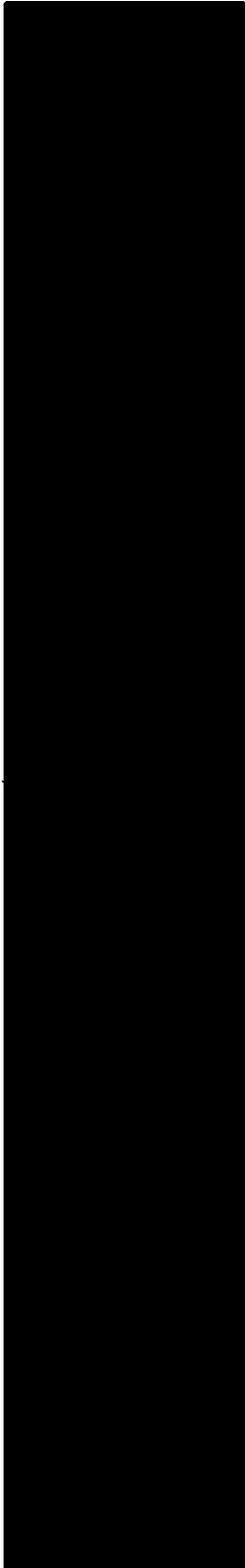
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ADDENDUM I

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S. E. ROCKFORD HOOKUP LIST



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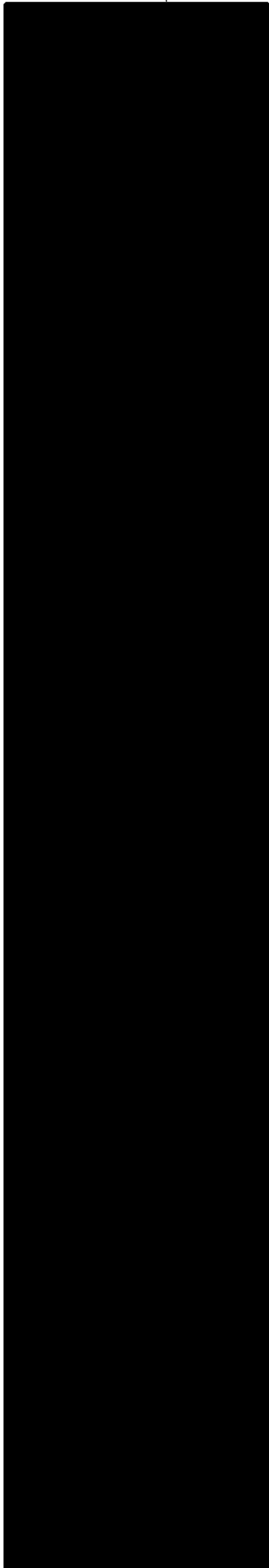
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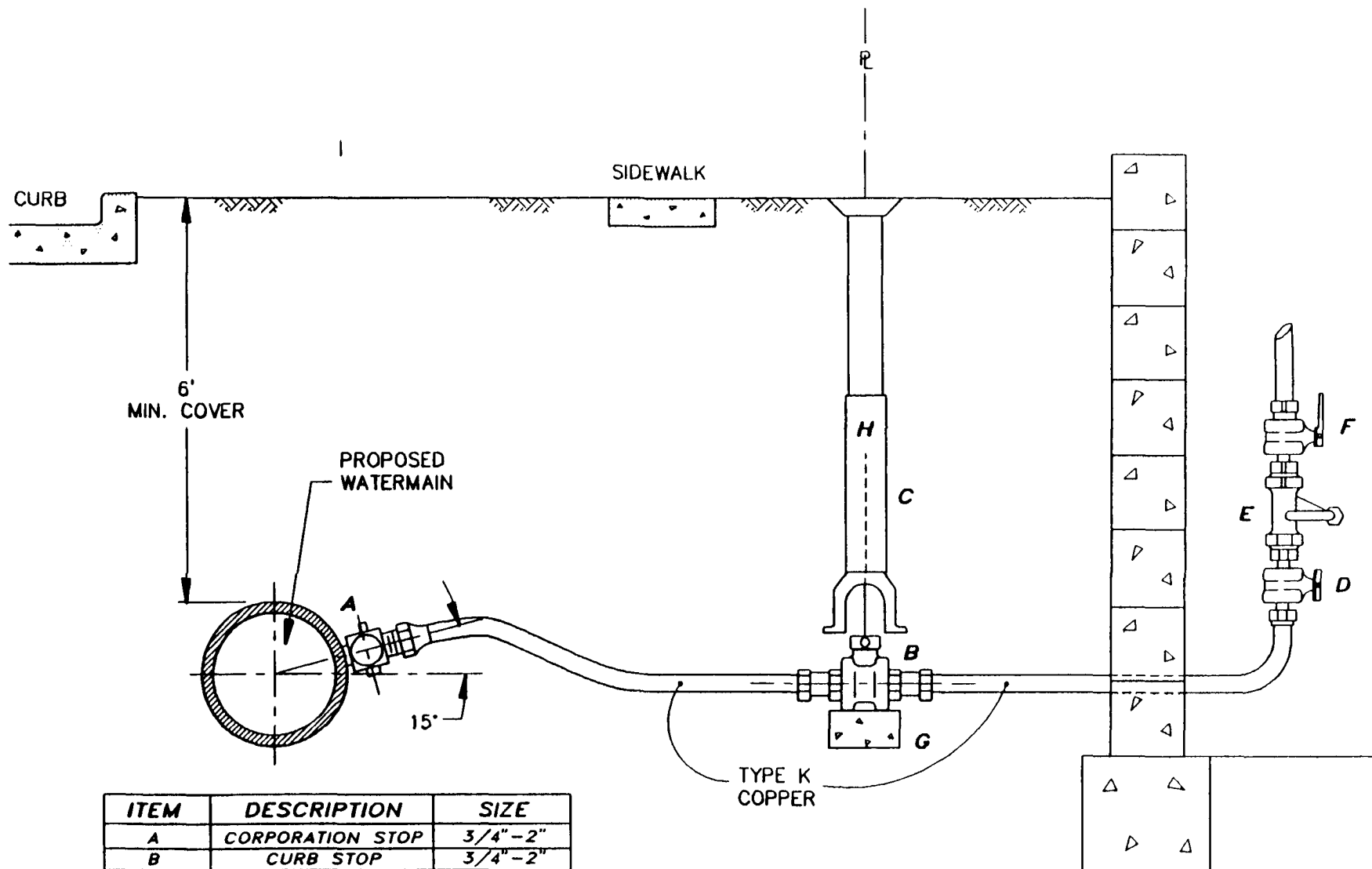
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ADDENDUM I

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* = signed up to date



ITEM	DESCRIPTION	SIZE
A	CORPORATION STOP	3/4"-2"
B	CURB STOP	3/4"-2"
C	CURB BOX	EXTENDABLE
D	METER STOP	3/4"-2"
E	METER SPREAD	5/8"-2"
F	METER STOP HOUSE SIDE	5/8"-2"
G	BRICK	CEMENT
H	ROD	36"

TYPICAL LOT SERVICE

ATTACHMENT III
SPECIFICATIONS FOR GAC FACILITY

DIVISION 1 - GENERAL REQUIREMENTS

0101. SCOPE

A. This Division applies to contracts 1-91 and 2-91.

B. Table of Contents

Paragraph numbering is not necessarily consecutive.

- 0101. Scope
- 0102. Progress Meetings and Reports
- 0103. OSHA Requirements
- 0104. Storage and Protection of Materials and Equipment
- 0105. Startup and Testing
- 0106. Existing Structures and Underground Facilities
- 0107. Protecting Work and Improvements
- 0108. Layouts
- 0109. Shop Drawings
- 0110. Drawing Revisions to Accommodate Equipment Supplied
- 0111. Manufacturer's Directions
- 0112. Maintenance Manual
- 0113. Fire Protection
- 0114. Dewatering and Protecting Adjacent Structures and Underground Facilities
- 0115. Erosion Control
- 0116. Final Cleanup
- 0117. Disposal Sites
- 0118. Temporary Facilities
- 0119. Property Stakes
- 0120. Availability of Lands/Site Access
- 0121. Site Security
- 0122. Permits
- 0123. Clarification - Contractor
- 0124. Wage Rates
- 0129. Construction Sign

0102. PROGRESS MEETINGS AND REPORTS

Progress meetings with Contractor will be held at such times as designated by Engineer. Responsible representatives of Contractor, who can bind Contractor to a decision at the meetings, shall attend.

Contractor, at the request of Engineer, shall submit reports detailing progress of the work,

compliance with submitted progress schedules and future construction plans affecting the schedule of the work.

0103. OSHA REQUIREMENTS

All work including equipment, materials, and fabricated items provided under the Contract shall comply with the provisions of the "Occupational Safety and Health Act".

0104. STORAGE AND PROTECTION OF MATERIALS AND EQUIPMENT

Contractor shall confine its apparatus, storage of materials and equipment, and operations of its workers to limits indicted by law, ordinances, permits or directions of Engineer.

Contractor shall be responsible for all materials and equipment furnished by Contractor and shall replace, at its own expense, all such materials and equipment found to be defective in manufacture or damaged in handling after delivery by the manufacturer. This shall include the furnishing of all material and labor required for the replacement of installed materials and equipment found to be defective. All defective materials and equipment furnished by Contractor shall be promptly removed from the site by Contractor.

Contractor shall be responsible for the unloading and safe storage of materials and equipment furnished by or to Contractor and accepted and intended for the work. All materials that may be damaged by the weather and all equipment shall be stored in watertight sheds or trailers on the premises. Sheds shall have wood floors raised at least six (6) inches above the ground. Other materials shall be stored on wood skids or on gravel bases. All storage areas shall be orderly and shall be protected from Contractor's operations by barriers. Any equipment or material which is prime coated or finish painted shall be completely covered with plastic or cloth tarps. Owner assumes no responsibility for stored materials and equipment.

All stored materials and equipment shall be clearly tagged or labeled indicating directions for storage where appropriate. All storage shall be in accordance with the manufacturer's recommendations unless otherwise specified.

Materials in containers shall be delivered in original sealed containers, with seals unbroken and with labels plainly indicating materials, and directions for storage.

Damaged materials and equipment shall be immediately removed from the site.

0105. STARTUP AND TESTING

Prior to acceptance of any portion of the work, startup and testing of all equipment and materials furnished on the project by Contractor shall have been conducted in the presence of representatives of Contractor, Owner and Engineer and also manufacturer if requested

by Owner or Engineer. Contractor shall furnish whatever temporary installations and conductions are necessary in order to perform startup and testing of all equipment and materials furnished under the Contract. Temporary connections and equipment necessary during the startup and testing operation shall include, but not be limited to, temporary piping and electrical equipment and devices, temporary connection from various parts of the systems and any other labor, materials, fuel, devices or items required by Engineer for the startup and testing operation. Temporary conditions shall include filling with water, if necessary, to check equipment and materials. All temporary installations and conditions shall be removed by Contractor upon completion of start-up and testing.

0106. EXISTING STRUCTURES AND UNDERGROUND FACILITIES

Prior to any excavation, demolition, or drilling on site, Contractor shall contact owners of the underground facilities in and near the construction area of the intent to excavate, demolish, or drill. As part of this notification requirement, Contractor shall contact "JULIE". Contractor shall be aware that not all owners participate in "JULIE". A call to this agency shall not absolve Contractor of the requirements for contacting owners of all underground facilities in and near the construction area. Contractor shall give reasonable advance notice to "JULIE" and other owners for the notification which shall not be less than the minimum advance notification required.

Contractor shall proceed with caution in the excavation and preparation of the site so the exact location of structures and underground facilities can be determined. Contractor shall include in the Contract Price any costs for temporary or permanent relocations of such structures and facilities required to complete the work unless specifically indicated otherwise in the specifications. Contractor shall keep an accurate and complete record of all such structures and facilities encountered and shall provide Owner a copy of this record. The record shall include a description of the item encountered, opinion as to conditions, and adequate measurements and depths so that the item can be located in the future.

Contractor shall inspect all structures and underground facilities for condition and soundness. Unsound conditions shall be reported to the structure or facility owner immediately after exposing. Contractor shall not proceed with the work until the structure or facility owner has been notified. The owner shall then be given time to inspect and correct, if required, the structure or underground facility. Contractor may make claim under the provisions of Articles 11 and 12 of the General Conditions should Contractor feel a price or time adjustment is justified.

Any additional costs incurred because of failure of Contractor to report the condition of any and all existing structure or facility encountered shall be paid for by Contractor.

Whenever Engineer feels it is necessary to explore and excavate to determine the location of existing structures and underground facilities, Contractor shall make explorations and excavations for such purposes. If Contractor is required to perform additional work in

making the explorations and excavations, extra compensation will be allowed as provided for in the General Conditions.

0107. PROTECTING WORK AND IMPROVEMENTS

Contractor shall protect property, existing improvements, and work installed by contractor and others from damage. Protection to prevent damage includes temporary plugging of openings, holes and pipe ends that Contractor has installed. Property, improvements and work damaged shall be repaired or replaced by Contractor.

If more than one contractor is responsible, the cost shall be shared. Engineer will determine responsibility for damages. All repair and replacement methods shall be approved by Engineer.

0108. LAYOUT

Contractor shall be responsible for all lines, elevations, and measurements of buildings, structures, piping, utilities, and other work executed by Contractor under the Contract. Contractor must exercise proper precaution to verify figures before laying out the work, and will be held responsible for any error resulting from its failure to exercise such precaution.

0109. SHOP DRAWINGS

Complete shop drawings and descriptive data shall be submitted on all manufactured or fabricated items prior to 25% completion of the work or as indicated otherwise in the specifications. Except as noted, eight copies of shop drawings and descriptive data shall be submitted to Engineer for approval. For reinforcing and structural steel shop drawings, only five copies need to be submitted. (Three copies of these will be returned to Contractor after approval. One corrected copy will be returned to Contractor prior to approval for use in resubmittal.)

When shop drawing sheets have both border dimensions exceeding eleven inches, shop drawings shall be submitted in a reduced size suitable for binding. Reduced shop drawings shall have sheet dimensions as large as practical to avoid over-reduction, but shall have either a vertical or horizontal border dimension of eleven inches or less. This requirement does not apply to reinforcing and structural steel shop drawings.

0110. DRAWING REVISIONS TO ACCOMMODATE EQUIPMENT SUPPLIED

Any construction deviations from the drawings and/or specifications necessary to accommodate equipment supplied by Contractor, which result in additional costs to Contractor or other contractors, such additional costs shall be borne by Contractor. Contractor shall also pay any additional costs necessary for revisions of drawings and/or

specifications by Engineer.

0111. MANUFACTURER'S DIRECTIONS

Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer, unless specified to the contrary.

Wherever specifications call for work to be performed, or materials to be installed in accordance with the manufacturer's printed instructions or directions, Contractor shall furnish copies as required for shop drawings of those instructions or directions to Engineer before installing the material or performing the work.

0112. MAINTENANCE MANUAL

Prior to 50% completion of the Contract, Contractor shall furnish to Engineer four complete unbound copies of a maintenance manual for all equipment furnished. The manuals shall include manufacturer's instructions for maintenance and operation for each item of mechanical and electrical equipment. Manuals shall contain: operation instructions, lubrication schedules, types and quantities, preventative maintenance program, spare parts list, parts lists, I.D. No. and exploded views, assembly instructions, parts supplier location, trouble shooting and startup procedures and, where applicable, test data and curves. All sheets shall have reduced dimensions as described for shop drawings.

0113. FIRE PROTECTION

Contractor and subcontractor(s) who maintain or provide an enclosed shed or trailer shall provide and maintain in operating order in each shed or trailer a minimum of one fire extinguisher. More extinguishers shall be provided as necessary. Fire extinguishers shall be minimum dry chemical, non-freezing type, UL rating 2A-30BC, with 10 pound capacity for Class A, B and C fires.

0114. DEWATERING AND PROTECTING ADJACENT STRUCTURES AND UNDERGROUND FACILITIES

Contractor shall take all necessary precaution during dewatering operations to protect adjacent structures and underground facilities from subsidence, flooding and other damage. Any such facilities and structures damaged shall be repaired or replaced to the satisfaction of Engineer.

0115. EROSION CONTROL

Contractor shall provide erosion control measures as necessary to control discharge of

sediment laden water to surface waters. Overland discharge of water from dewatering operations shall not be allowed. Depending on water quality, such water shall either be piped directly to the surface water or shall be directed to sedimentation basins prior to discharge to surface waters. Contractor shall use jute netting, dikes, channels, and other applicable measures to prevent erosion of soils disturbed by its construction operation. Restoration of the site shall proceed concurrently with the construction operation.

0116. FINAL CLEANUP

Contractor shall be responsible for cleaning up its work and its waste and rubbish on a daily basis. It is Contractor's responsibility to completely clean up the inside and outside of all buildings and the construction site at the completion of the Work.

0117. DISPOSAL SITES

It shall be the responsibility of Contractor to dispose of all excess excavated material resulting from construction operations for which Contractor is responsible. Contractor shall make all necessary arrangements to find a suitable disposal site unless otherwise stated in the Contract Documents.

0118. TEMPORARY FACILITIES

A. Temporary Toilets - Contractor for Contract 1-91 shall provide and maintain sanitary temporary chemical toilets located where approved and in sufficient number required for the force employed by Contractor.

B. Temporary Electrical Services - Contractor may use existing electrical service upon written notification to Owner. Contractor shall provide all equipment etc. to use such service but shall not impair the operation of the facility while using same.

C. Weather Protection and Temporary Heat - Contractor shall provide weather protection to protect the Work from injury due to freezing, rain snow and other inclement weather during construction.

Within buildings, Contractor shall provide temporary heat if necessary, without cost to Owner from the time the buildings or portions thereof are enclosed until the Project is accepted or occupied by Owner, whichever occurs first. The building work is to be heated during construction so a minimum temperature of 50°F is maintained at all times. The temporary heating equipment shall be of a type approved by Engineer.

D. Temporary Telephone - Contractor for Contract 1-91 shall provide, without extra cost to Owner, a job telephone at each site for the duration of the work at the site. Party making toll calls shall pay for same. Telephone lines are on-site.

E. Temporary Water - Contractor shall supply its own water during construction from Owner's system. Contractor shall also provide its own piping, valves and appurtenances for its requirements. Connection to the existing water system shall be coordinated with Owner.

0119. PROPERTY STAKES

All property stakes removed during construction of the work shall be replaced at the expense of Contractor. The replacement shall be accomplished by a Registered Land Surveyor hired by Owner.

0120. AVAILABILITY OF LANDS/SITE ACCESS

Easements were not obtained at time of bidding for this project. Contractor shall contain its operation to within the rights-of-way or lands upon which the work is to be performed as directed by Owner.

Access to Well No. 24 site is controlled by Rockford Airport Authority. Contractor shall coordinate access to site with Owner during construction.

0121. SITE SECURITY

Contractor shall have the sole responsibility of safeguarding the site perimeter to prevent unauthorized entry to the site throughout the duration of the project. Whenever, in the judgment of Owner, the site is not sufficiently safeguarded, Owner may order additional protection. In the event that there is not sufficient time for Contractor to provide such safeguards, Owner may have the work and site safeguarded by others and deduct the costs from the payments due Contractor.

Contractor shall at all times be responsible for the security of work, plant, and equipment. Owner will not take any responsibility for missing or damaged equipment, tools, or personal belongings. Contractor shall have the sole responsibility of safeguarding its work and work area throughout the duration of the project. Contractor shall at all times provide such permanent and temporary fencing or barricades as may be necessary to restrict unauthorized entry to its construction area. Contractor shall supplement such protective fences and barricades by the use of acceptable lights and flags, watchmen, signs and other measures that may be necessary to afford proper, safe, and sufficient protection.

0122. PERMITS

The following permits were obtained by the Owner:

1. IEPA Construction Permit

It is included as attachments to this division. Contractor shall comply with all provisions of

this permit and shall be responsible for notifications as required by same. Where the requirements of any permit is more restrictive than the drawings or the specifications, the permit requirements shall govern.

0123. CLARIFICATION - CONTRACTOR

If anywhere in these Documents, General, Mechanical, Plumbing or Electrical Contractor is mentioned, it shall be considered to mean General Contractor for this Contract.

0124. WAGE RATES

Contractor and any subcontractor shall pay all laborers, workers, and mechanics performing work under the Contract not less than the prevailing wage rates adopted by Owner or determined by the court on review and filed with the Secretary of State in Springfield. A copy of the Schedule of Prevailing Wage Rates is attached hereto.

Contractor shall keep or cause to be kept a record of employees and wages paid as required by the Prevailing Wage Act (Ill. Rev. Stat., Ch. 48, Sect. 39s-5). Contractor shall also require each subcontractor employed on the project to keep these same records.

Contractor shall comply with the Illinois Preference Act (Ill. Rev. Stat., Chapter 48, Section 2201-2207) in the hiring of labor for the project.

0129. CONSTRUCTION SIGN

A. Contractor for contract 1-91 shall furnish and erect as directed by Owner, a construction sign to be maintained and kept in place until completion of the Contract.

B. The sign shall be constructed by a professional sign painter approved by Owner, and shall show the name of the project, Owner, all prime contractors and Engineer. Owner will select colors of paint required. General sign layout shall be as shown in detail attached at the end of these specifications.

DIVISION 2 - SITE WORK

0201. SCOPE

- A. Applicable provisions of Division 1 shall govern work in this section.
- B. In general, this section includes clearing and grubbing, excavation, dewatering, filling, backfilling, grading, seeding and sodding, fence, roads, demolition and removals to complete the work as shown or specified.
- C. All excess and undesirable material, including waste concrete, debris, trees, fencing, and foreign materials, shall be removed from the site at the expense of the Contractor. The Owner maintains first claim against all excess materials.

d. Work Included:

- 0210. Scope
- 0202. General Provisions
- 0212. Clearing and Grubbing
- 0220. General Excavation
- 0221. Rock Excavation
- 0224. Replacing Unsuitable Foundation Material
- 0225. Dewatering
- 0226. Sedimentation Basins
- 0227. Fill and Backfill
- 0228. Embankment Fill
- 0229. Finish Grading
- 0240. Sheeting and Bracing
- 0260. Roads and Parking Areas
- 0270. Chain Link Fence
- 0280. Seeding and Sod

0202. GENERAL PROVISIONS

- A. The "area of the site" referred to in these specification shall be as shown on the drawings. All construction operations shall be confined within the "area of the site" limits.
- B. The elevations shown for existing work and ground are reasonably correct, but are not guaranteed to be absolutely accurate. No extras will be allowed because of variations between drawings and actual grades.
- C. The General Contractor shall be responsible for the integrity of existing property irons. All property irons disturbed during the course of the project shall be properly

relocated by a registered land surveyor as a part of this Contractor's work.

0212. CLEARING AND GRUBBING

A. Clearing and grubbing shall consist of cutting and disposing of trees, brush, windfalls, logs, and other vegetation, and the removing and disposing of roots, stumps, stubs, grubs, logs and other timber from within the clearing and grubbing limits as defined on the drawings, designated to be removed on the drawings or in the specifications or fall within the excavation, embankment or improved areas of the site.

B. All roots and stumps shall be removed to a depth of not less than 12-inches below the original ground surface in embankment areas. In cut areas, such material shall be removed to a depth of not less than 12-inches below the subgrade.

0220. GENERAL EXCAVATION

A. All excavation whether for structure, piping, wiring, or appurtenances shall be unclassified. No extras will be allowed for rock excavation, quicksand excavation, muck excavation, or any other type of excavation encountered. All material other than firm solid earth, sand or gravel shall be removed from under concrete to be poured on ground.

B. The Contractor shall strip all topsoil in areas that will be built upon or have surface improvements, including roadways and walks. Thereafter, the site shall be cut and filled to the indicated subgrade elevation and as specified.

C. No footings or slabs shall bear on soil within two feet of existing grade. Where subgrade is within two feet of existing grade, remove soils to two feet below existing grade and backfill with compacted fill.

D. When excavations reach subgrade elevations as shown on the drawings, or as specified herein, the Engineer will inspect the bottom material. If additional material requires removal and replacement, it shall be paid for as provided under the section "Replacing Unsuitable Foundation Material". The existing soil shall be compacted prior to footing construction density natural loose zones or materials disturbed during the excavation process.

E. Excavations that are undercut beneath the foundation shall extend beyond the perimeter of the foundation a distance at least equal to the depth of undercut below footing grade.

F. All general excavation shall be included in the lump sum bid. Plan changes which require additions to or deductions from the excavation will be adjusted on the basis of the unit price for changes contained in the contract.

0221. ROCK EXCAVATION

- A. All rock excavation shall be included in the general excavation and included in the Lump Sum Bid.
- B. The use of explosives will not be permitted without written permission of the Owner.
- C. The Contractor shall perform all blasting in accordance with local laws and regulations.

0224. REPLACING UNSUITABLE FOUNDATION MATERIAL

- A. Where ordered by the Engineer, original material below the excavation necessary for construction according to grades shown or specified, shall be removed and replaced with material and placing methods as specified under compacted fill. The Contractor shall INCLUDE in his Lump Sum bid, the cost of replacing 25 cubic yards of unsuitable foundation material as defined in this Section. Payment to the contractor for unsuitable foundation material will be adjusted, add or deduct, based upon the actual unsuitable material excavated (more or less than 25 cubic yards) and the Contract unit price for replacing unsuitable foundation material.
- B. Extra payment will not be made for required undercutting and filling or gravel bedding material required for placing concrete above water level as required under the concrete specifications, Section 0330.H.8. The lump sum bid shall include any removal and replacement of excavated material so indicated on the plans or specified herein.

0225. DEWATERING

- A. The Contractor shall, at his own expense, keep the excavation clear of water while the structures are being built and fill and backfill are being compacted; and under no conditions, except by the written consent of the Engineer, will the work be allowed to be laid in water, and no water shall be allowed to flow over the work until the concrete has set to the satisfaction of the Engineer.
- B. Dewatering shall be sufficient to lower the piezometric level to at least two feet below the bottom of the excavation in order to create a stable sub-grade. In areas where rock is encountered, the water level shall be kept at or below top of rock, but at least four inches below bottom of concrete.
- C. The water level shall be maintained below the bottom of the structures until the structure excavation is backfilled.

0226. SEDIMENTATION BASINS

Sedimentation basins to prevent erosion of excavated earth and to receive soil laden water pumped from excavations for structures shall be provided as necessary. All ditches and piping required to prevent runoff of soil laden water shall be provided. The location of these facilities shall be approved by the Engineer. When the project is completed, all areas disturbed by facilities constructed to prevent erosion shall be obliterated and graded and seeded as hereinafter specified.

0227. FILL AND BACKFILL

A. All fill and backfill in excavated areas around all structures and under some structures, as specified, and under roadway, parking and curb and gutter areas, shall be compacted fill in accordance with the following specifications to the bottom of the topsoil, structure, or other improvement. Unless otherwise noted, structures with a top slab shall not be backfilled until the slab is in place and has reached its specified 28-day strength. In fill areas above existing grade around structures, compacted fill shall be placed within a minimum of ten feet from the structure. No fill will be allowed to be placed under water. All fill and backfill necessary to complete the work, according to the plans and specifications, shall be included in the lump sum bid.

B. Compacted fill shall be granular material with no stones larger than four inches and shall be reasonable uniformly graded throughout the particle size range. Of that portion of the material passing the No. 4 sieve, not more than 25% shall pass the No. 200 sieve and material shall have less than 5% clay content. When placing fill during wet weather or in wet areas, this requirement shall be modified to not more than five percent passing the No. 200 sieve. Adequately dewatered areas are not defined as wet areas. In areas where there is inadequate room for compaction equipment, Class X concrete shall be used as fill material. The Contractor shall submit a sieve analysis of the material to be used for approval by the Engineer. Additional analyses shall be submitted if the fill source changes.

C. No frozen material shall be placed nor shall the fill be placed on frozen ground. Compacted fill shall not be placed when the temperature is below 20°F.

D. Compaction

Class 1 Compaction - This class of compaction shall apply to all fill areas under buildings, structures, piping, bituminous roadway and parking areas, curb and gutter, and backfill within ten feet of structure walls. All compacted material shall be placed in uniform layers not exceeding eight inches in loose thickness prior to compaction. Each layer shall be uniformly compacted to a dry density at least 95% of the maximum dry density as determined by a laboratory compaction test at the optimum moisture content (ASTM Test Designation D1557). Compaction shall be obtained by vibratory compaction equipment. Compaction testing will be conducted

by the Owner or his representative. The Contractor shall cooperate with the Engineer in sampling and testing fill.

Class 2 Compaction - This class of compaction shall be used in excavated areas beyond 10 feet of structures without any piping, or adjacent foundations. Material for backfill shall be granular material as specified above. The material shall be deposited, spread and leveled in layers generally not exceeding 12-inches in thickness before compaction. Each layer of the fill shall be compacted to at least 90% of the maximum dry density (testing same as Class 1). Compaction shall be obtained by vibratory compaction equipment.

0228. EMBANKMENT FILL

A. Excavated material which has been dried may be placed in fill areas to be seeded or sodded if no piping exists in the fill and the areas are at least ten feet from any structure. Material for this purpose shall contain no logs, stumps, brush, rubbish or other perishable material. The top 12 inches of the earth embankment shall be earthy material free from large stones.

B. The embankment material shall be deposited, spread, and leveled in layers generally not exceeding 12 inches in thickness before compaction. Each layer shall be compacted to the degree that no further appreciable consolidation is evidenced under the action of the compaction equipment. The required compaction shall be obtained for each layer before any material for a succeeding layer is placed thereon. Compaction shall be obtained using the hauling and leveling equipment and in addition tamping rollers, pneumatic-tired roller, vibratory rollers, or other types of equipment required to produce the desired results.

0229. FINISH GRADING

A. Except for paved or built-upon areas, all disturbed areas shall be finished graded under this Contract. Areas around structures shall be graded to provide uniform drainage away from the structure. The top twelve inches of soil shall contain no stones. Except as noted below, the area to be seeded or sodded shall be covered with at least four inches of topsoil.

B. Topsoil shall consist of the natural loam, sandy loam, silt loam, silty clay loam or clay loam humus-bearing soils adapted to the sustenance of plant life, and such topsoil shall be neither excessively acid nor excessively alkaline. It shall be free of weeds, stones, debris, vegetable material and excesses of peat, sand or clay.

C. Prior to seeding, all topsoil shall be loosened to a depth of three inches and ranked to remove all extraneous matter. A commercial fertilizer, minimum 10% Nitrogen, 10% Phosphorus Acid, and 10% Potash shall be applied at the rate of 17 pounds per 1,000 square feet. It shall be worked into the top two inches of topsoil.

D. Lawns shall be finish graded to meet walks and adjoining surfaces, after settlement, so that no water pockets or ridges will be left.

0240. SHEETING AND BRACING

The Contractor shall furnish such sheeting and bracing required and as may be necessary to perform the work and protect existing structures and adjoining property. All excavation shall be done in such a manner as will safeguard the lives of workmen and passersby, and all excavation shall conform to OSHA regulations and local codes.

0260. ROADS AND PARKING

A. The work shall be done in accordance with Standard Specifications for Road and Bridge Construction, State of Illinois, Division of Highways. See Division 2, Section 0220., General Excavation herein, for excavation and fill requirements.

B. Gravel surfacing shall be aggregate meeting Gradation CA-6 materials and construction placement in accordance with Article 301. Thickness shall be as indicated on plans.

C. All roads and parking areas shall be included in the lump sum bid.

0270. CHAIN LINK FENCE

A. New chain link fence with three-strand barbed wire shall be installed as shown on the drawings. The chain link fence shall be USS Cyclone, Century Fence, or equal.

B. Fabric to be No. 9 gauge galvanized or aluminum coated steel wire woven in a two-inch mesh; top and bottom salvage to have barbed finish. Galvanized coating of wire surface shall be in accordance with A392-68T. Zinc coating shall be Class 2, minimum of 2 oz. of zinc per square foot of wire surface. The weight of coating shall be determined by the strip test, ASTM A-428. Aluminum coating shall conform to ASTM A-181 and shall be .40 oz/sq ft minimum. Fabric height shall be six-feet with three strand barbed wire at a 45° angle.

C. All posts and rails shall be either Type I Schedule 40 pipe with 1.8 ounce per square foot zinc coating conforming to ASTM Specification A-120; or Type II pipe manufactured from steel conforming to ASTM A-569, Cold-Formed, Electric Welded and Triple Coated with 1.0 ounce \pm .1 ounce zinc per square foot, 30 \pm 15 micrograms Chromate, 0.5 \pm 0.2 mils clear cross-linked polyurethane acrylic exterior coating. The internal surface shall be given corrosion protection by .2 inches rich based organic coating with an 87% minimum zinc powder loading, with the capacity of withstanding 300 hours when subjected to Salt Spray Test ASTM B-117 with a 5% maximum red rust.

D. Intermediate posts shall be 2.5 inch O.D., round column Type 1 3.65 pounds per foot, Type II 3.12 pounds per foot or 2.25 inch x 1.7 inch 11 gauge C section.

E. All end, corner and pull posts shall be 2-7/8 inch O.D. standard weight pipe, Type 1 5.79 pounds per linear foot, or Type II 4.64 pounds per foot. All posts shall be set at the midway point of all lines 500 feet or longer and at all changes of direction and/or grade variations of 15' or more. All posts shall be set in concrete footing with bell shaped bottom and crowned top, penetrating three feet minimum below original grade. Footings shall have a minimum diameter of ten inches. concrete shall be poured against undisturbed ground or inside of form left in place. Line posts shall be evenly spaced ten feet or less apart. Pipe posts shall have tops which exclude moisture. A top rail is required. Rails shall be 1-1/5 inch x 1-1/4 inch 14 gauge rolled formed section or 1-5/8 inch OD Type 1 2.27 pound per foot or Type II 1.84 pounds per foot pipe. Top rail shall pass through intermediate posts and form a continuous brace within each stretch of fence and be securely fastened to terminal posts. Provide No. 7 gauge bottom tension wire.

F. All posts shall be braced with the same material as top rail and trussed to line posts with 3/8 inch diameter rods and tightened. One brace assembly shall be furnished with each end or gate post and two assemblies with each corner or pull post.

G. All gates shall be swing type with three strand barbed wire. Gate width shall be as shown on the drawings. Gate construction shall be sized in accordance with Chain Link Fence Manufacturers Institute Product Manual and shall be properly braced and trussed. Gates shall have positive type latching devices with provision for pad locking. Provide padlocks for all gates. Transition 45° angle barbed wire at gates as required.

H. Installation at fence and gate shall be by experienced fence erector. Upon completion, all excavated materials shall be removed from the site or spread as directed by the Engineer.

0280. SEEDING AND SOD

A. Except for built upon areas, all areas of the site which are disturbed shall be seeded or sodded. Surfaces on 3 to 1 slope or less shall be seeded and surfaces on greater than 3 to 1 slope shall be sodded.

B. Seed mixture shall be as specified below:

Table of Seed Mixture			
Seeds	Mixture		
Species	% Purity	% Germination	% in No. 1
Kentucky Blue Grass 85/80	85	80	50
Creeping Red Fescue	97	80	25
Perennial Ryegrass	95	90	25

Seed Mixture No. 1 shall be used in all areas. Weed content shall not exceed 0.5 percent in mixture.

C. Seed mixture No 1 shall be applied at the rate of 3-1/2 pounds per 1,000 square feet. The seed mixture shall be sown by means of equipment adapted to the purpose, or it may be scattered uniformly over the areas to be seeded, and lightly raked or dragged to cover the seed with approximately one-fourth inch of soil. After seeding, the areas shall be lightly rolled or compacted by means of suitable equipment, preferably of the cultipacker type when such equipment can be operated, or by means of light hand tamper. Fertilizer is specified under Section 0229, Finish Grading.

Scattering seed by hand shall be done only with satisfactory hand seeders and only at such times when the air is sufficiently quiet to prevent seeds from blowing away.

D. Mulch shall be placed on a given area within three days after the seeding has been completed. Mulching material shall consist of any straw, hay, wood excelsior fiber or other suitable material of a similar nature which is substantially free of noxious weed seeds and objectionable foreign matter.

Erosion control mats of open weave jute netting and bale checks shall be installed as needed in areas of probable washout (i.e., drawings swales, ditches, near culverts, etc.).

E. Sod shall be of the above specified composition, be reasonably weed free and freshly cut. It shall be tamped or rolled into firm contact with the top soil, and staked where necessary to hold in place.

F. All seeded and sodded surfaces shall be kept properly wet by the Contractor until established.

G. Seeding and sodding shall be done between April 15 and June 15, or between August 15 and October 15. Areas of erosion or poor grass catch shall be repaired and reseeded as ordered by the Engineer. Irregular ground surface areas shall be rolled. A uniform stand of two inches shall be considered an acceptable grass catch.

**DIVISION 3 - CONCRETE
GENERAL CONSTRUCTION WORK**

0301. SCOPE

- A. Applicable provisions of Division 1 shall govern work of this division.
- B. The General contractor shall form, reinforce, and cast all concrete on this project as shown on the drawings or as specified herein.
- C. The Contractor shall be familiar with the Specifications for Structural Concrete for Buildings with Selected ACI and ASTM references SP-15 by American Concrete Institute.
- D. Work Included:
 - 0301. Scope
 - 0310. Concrete Formwork
 - 0320. Concrete Reinforcement
 - 0330. Cast-in-Place Concrete
 - 0331. Cast-in-Place Concrete - Special Conditions

0310. CONCRETE FORMWORK

A. General

- 1. The contractor shall assume the responsibility for the complete design and construction of the formwork.
- 2. ACI Standard Recommended Practice for Concrete Formwork, ACI 347, shall be the guide for design and construction of the formwork.
- 3. Subheadings in this section are:
 - A. General
 - B. Materials
 - C. Design
 - D. Construction
 - E. Form Ties
 - F. Form Removal
 - G. Supplemental Unit Prices

B. Materials

- 1. Forms shall be of wood, plywood, steel, fiberboard lined, or other approved materials.

The type, size, quality, and shape of all materials of which the forms are made are subject to the approval of the Engineer.

2. Caution shall be exercised in the use of wood or composition forms or form liner to be certain that no chemical reaction will take place which causes a damaging effect on the concrete surface.

3. Prior to placing any concrete, submit manufacturer's data and installation instructions for proprietary materials including form coatings, ties and accessories, and manufactured form systems if used.

C. Design

1. Formwork must be adequately designed, erected, supported, braced, and maintained so that it will safely support all vertical and lateral loads that might be applied until such loads can be supported by the concrete structure.

2. The weight of the formwork, freshly placed concrete, workmen and equipment, rate of placement and temperature, tamping and vibration of the concrete shall all be considered in the design of the formwork.

D. Construction

1. Forms shall conform to the shape, line, grade, and dimensions as shown on the drawings. They shall be mortar-tight and sufficiently rigid to prevent displacement or sagging between supports and shall support the loads and pressures without deflection from the prescribed lines. They shall be properly braced or tied together so as to maintain position and shape an insure safety to workmen and passersby.

2. Formwork shall be constructed to meet the tolerances and intentions specified below for the indicated applications.

a. Flat surfaces shall be formed in accordance with tolerances indicated in ACI-347 for buildings.

b. Curved surfaces shall also meet ACI-347 for buildings. All exposed curved surfaces shall be formed to the continuous surface of the radius specified. Where segmented forms are proposed, a form system which deviates more than 3.8-inch from a circle through pan edges will not be allowed. Formwork system approval by Engineer for segmented forms shall be required prior to construction.

c. Architectural surfaces and surfaces to be fitted with equipment shall be formed to match the shape intended. Where indicated on the drawings or directed by the engineer, the form shall be lined with minimum 3.8-inch masonite and skimmed as

required. Formwork system approval by Engineer for these areas shall be required prior to construction.

d. Variation from plumb shall not exceed 1/4-inch in 10-feet and variation in linear lines shall not exceed 1/2-inch in twenty feet. These and other tolerance specified in ACI-347 shall be considered a part of this specification.

3. When forms are placed for successive concrete placement, thoroughly clean concrete surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure joints to avoid offsets.

4. At the request of the Engineer, temporary openings shall be provided at the base of column forms and wall forms and at other points where necessary to facilitate cleaning and inspections immediately before depositing concrete. Openings to be located as directed by the Engineer.

5. Install inserts and provide openings in concrete form work to accommodate work of other trades. Verify size and location of openings, recesses and chases with the trade requiring such items. Securely support items to be built into forms.

6. Provide top forms for inclined surfaces where the slope is too steep to place and vibrate concrete.

7. Bevel wood inserts for forming keyways (except in expansion joints), reglets, recesses, and the like, to assure ease of removal. Unless otherwise shown or directed, chamfer strips shall be placed in the angles of the forms to provide 3/4-inch bevels at exterior edges and corners of all exposed concrete.

8. The forms shall be oiled with a field applied commercial form oil or a factory applied non-absorptive liner. Oil shall not stain or impede the wetting of surfaces to be cured with water or curing compounds. The forms shall be coated prior to placing reinforcing steel. Oil on reinforcement will not be permitted.

9. All form surfaces shall be thoroughly cleaned, patched, and repaired before reusing and are subject to the approval of the Engineer.

E. Form Ties

1. Internal wall ties shall contain positive stops at the required wall thickness. The exterior clamp portions of the tie shall be adjustable in length. Ties shall contain cones on the water side of water containing structures and on the exterior side of all structures which have water-stopped construction joints. Ties shall provide a positive disconnection on both ends 1 to 1-1/2 inches inside the finished face of the concrete.

2. All wall ties used in the placement of structures which have water-stopped construction joints shall contain integral water-stops. All such ties shall be crimped or deformed in such a manner that the bond between concrete and tie cannot be broken in removal of the outer units. This portion of the tie shall not be removed prior to 24 hours after completion of the concrete placement.

3. The exterior or removal portion of the ties shall be removed with the use of a special tool designed for this purpose. Cutting or chipping of concrete to permit removal of exterior portion will not be permitted. No ties shall be completely pulled from the wall.

4. Spacing of the ties shall be recommended by the tie manufacturer.

5. The use of wood spacers and wire ties will not be approved.

F. Form Removal

1. Supporting forms and shoring shall not be removed until the member has acquired sufficient strength to support its own weight and the construction live loads on it. Forms shall not be removed without the approval of the Engineer. All form removal shall be accomplished in such a manner that will prevent injury to the concrete and will insure complete safety of the structure.

2. Forms shall not be removed before the expiration of the minimum times as stated below unless specifically authorized by the Engineer. These times may be increased by the Engineer.

Wall and vertical faces	24 hours
Columns	24 hours
Beams and slabs	14 days

G. Supplemental Unit Price

The Contractor shall fill in a unit price for "Forming", including items A through F in this section, in the blank space provided in the proposal to apply in the event of any deductions from or additions to the work.

0320. CONCRETE REINFORCEMENT

A. General

1. The Contractor shall supply reinforcing steel and accessories as shown on the drawings and as specified herein. Reinforcing shall comply with pertinent provisions of CRSI "Manual of Standard Practice" and American Concrete Institute 318.

2. Subheadings in this section are:

- A. General
- B. Materials
- C. Shop Drawings and Fabrication
- D. Placement
- E. Supplemental Unit Price

B. Materials

1. Unless otherwise stated in these specifications or on the drawings, reinforcing steel shall conform to ASTM A615 Grade 60.

2. Welded wire fabric shall conform to ASTM A82 and A185.

3. Reinforcing shall have suitable marks to visually determine grades at job site. Mill tests shall be submitted on all projects requiring more than 25 tons of reinforcing and be submitted at the request of the Engineer on smaller projects.

C. Shop Drawings and Fabrications

1. Before fabrication of the reinforcement is begun, the Contractor shall obtain the approval of the Engineer on reinforcing bar lists and placing drawings. These drawings and lists shall show in detail the number, size, length, bending, and arrangement of the reinforcing. Reinforcing supports shall also be located on the shop drawings. Shop drawings shall be in accordance with ACI 315.

2. Reinforcing shall be bent cold in shop to conform to required shapes and dimensions, with fabrication tolerances complying with CRSI Manual. Heating of reinforcement will not be permitted, and reinforcement shall not be bent or straightened in any manner that will injure the steel. Unless otherwise shown on the drawings, all end hook dimensions shall conform with "ACI Standard Hooks."

3. Splices in reinforcing shall be avoided wherever possible. Splices shall be Class C in accordance with ACI 318 and adjacent splices shall be staggered a minimum of 40 bar diameters unless otherwise shown.

4. Deliver reinforcement to the job site bundled, tagged and marked with size, lengths, and bar marks corresponding to shop drawings. Store reinforcement at the job site on blocks in a manner to prevent damage and accumulation of dirt and excessive rust.

5. Where reinforcing is not shown, provide a minimum of #4 at 8-inch centers each way in members 10-inches or less in thickness and #5 at 12-inch centers each way in each face in members greater than 10-inches thick.

D. Placement

1. All reinforcing shall be placed in accordance with contract drawings and with shop drawings stamped and approved by the Engineer.
2. Reinforcement shall be positioned within plus or minus 3/8 inch for members with depth to tension reinforcing from compression face less than or equal to 8 inches. Tolerance shall be plus or minus 1/2 inch for members with depth to tension reinforcing from compression face greater than 8 inches. Secure against displacement by anchoring at the supports and bar intersections with wire or clips. Bars shall be securely tied at all intersections except where spacing is less than one foot in each direction, when alternate intersections shall be tied. Set wire ties so that twisted ends are directed away from exposed concrete surfaces. To avoid interference with embedded items, bar spacing may be varied slightly as approved by the Engineer. Tolerance on dimension between adjacent bars in slab and wall reinforcing mats shall be one inch. If carrier bars are to be used, Contractor shall provide reinforcing bars for this purpose in addition to the reinforcing called for by the drawings and specifications.
3. Wall reinforcing mats shall be secured in a vertical plane by providing clearance from forms with bar supports and by using Z-shaped bars at ± 4 feet on center wired between two mats of steel, spacing and staying both of them. Nails shall not be driven into the forms to support reinforcement and neither shall wire for this purpose come in contact with the forms. Alternate top transverse bars in slab shall be supported by individual bar chairs at approximately 3'-0" centers. Bottom longitudinal bars shall be supported by continuous bar chairs at approximately 4'-0" centers.
4. Tack welding of reinforcing will not be permitted unless specifically shown.
5. If reinforcing must be cut because of openings or embedded items in the concrete, additional reinforcing must be provided adjacent to the opening at least equal in cross sectional area to that reinforcing which was cut and it shall extend a minimum of 36 bar diameters beyond the opening on each side or as shown on the drawings. At sumps or depressions in slabs, bars shall be bent and/or extended under sumps or depressions.
6. Unless otherwise shown on the drawings, the reinforcement is to be so detailed and placed as to allow the following concrete protection:
 - a. 3-inches of cover where the concrete is placed directly against ground.
 - b. Two inches of cover where the concrete is placed in forms, but is to be exposed to weather, liquid, or the ground.
 - c. One inch cover in slabs and walls not exposed to weather, liquid, or the ground.

d. One and one-half inch cover in beams, girders, and columns not exposed to weather, liquid, or the ground. This cover applies to beam stirrups and column ties where applicable.

7. Reinforcement shall be supported with steel bar supports and spacers, sufficient in numbers and strength to properly carry the reinforcing steel and construction loads as recommended by the Concrete Reinforcing Steel Institute. Where the concrete surface will be exposed to weather or moisture, or where it will be exposed to view, the supports shall be galvanized or shall have plastic tips.

8. When supports bear directly on the ground and it is not practical to use steel bar supports, precast concrete blocks may be used to support only the bottom lift of reinforcement. The precast blocks must be solid, be of an equal or higher strength than the concrete being placed, must provide adequate support to the reinforcement, and be of a proper height to provide specified reinforcing cover. The use of face bricks, hollow concrete blocks, rocks, wood blocks, or other unapproved objects will not be permitted.

9. Do not use bar supports as bases for runways for concrete conveying equipment and similar construction loads.

10. Provide approved reinforcing splices by lapping ends, and tightly wire tying reinforcing in contact.

11. Welded wire fabric shall be lapped a minimum of 1 mesh plus end extension of wires, but not less than 6-inches and shall be wire tied. Install in as long a length as practicable.

12. Reinforcing bars shall be clean and free of mud, loose scale, oil, loose rust, hardened concrete, or other coatings that may destroy the bond.

13. After reinforcement is placed and before placing concrete over it, the Engineer shall be allowed sufficient time to inspect the reinforcing. All reinforcing must be securely positioned prior to placing concrete.

E. Supplemental Unit Price

The Contractor shall fill in a unit price for "Reinforcing", including items A through D in this section, in the blank space provided in the proposal to apply in the event of any deductions from or additions to the work.

0330. CAST-IN-PLACE CONCRETE

A. General

1. The Contractor shall furnish and install the concrete as shown on the drawings and

as specified herein. All concrete shall meet the requirements of ACI 318 "Building Code Requirements for Reinforced Concrete" and the following specifications.

2. Subheadings in this section are:

- A. General
- B. Materials
- C. Proportioning
- D. Mixing
- E. Joints
- F. Bonding to Existing Concrete
- G. Embedded Items
- H. Placing Concrete
- I. Curing
- J. Hot Weather Concrete
- K. Cold Weather Concrete
- L. Finishing
- M. Loading of Concrete Structures
- N. Non-Shrinking Cement
- O. Testing and Sampling
- P. Records
- Q. Supplemental Unit Price

B. Materials

1. Cement

a. All cement used shall be Portland Cement and shall conform to ASTM C150 and shall be Type I or Type III. Type III shall be used only when permitted by the Engineer. All cement shall be the product of one reputable manufacturer and mill.

b. Cement shall be stored in a dry, weathertight, properly ventilated structure with the floor raised not less than one foot above the ground.

c. The cement shall be in compliance with ASTM C150 and certified mill test results shall be submitted to the Engineer, unless such report is waived by the Engineer. Report shall identify brand, type, and chemistry of cement used.

2. Aggregate

a. All aggregates shall be washed and shall consist of natural sand, gravel or crushed rock, and shall have clean, hard, durable, uncoated grains of strong minerals. The amounts of deleterious substances present in the fine and coarse aggregate expressed in percentages by weight shall not exceed the following:

<u>Deleterious Substance</u>	<u>Aggregate</u>	
	<u>Fine</u>	<u>Coarse</u>
Clay Lumps and Friable Particles	3.0	3.0
Coal and Lignite	0.5	0.5
Mineral finer than No. 200 sieve	3.0	1.0
Soft Fragments	3.0	3.0
Chert	---	5.0
Sum of Chert and Clay Lumps		5.0

*Material classified as chert and having a bulk specific gravity of less than 2.45. The percentage of chert shall be determined on the basis of the weight of chert in the sample retained on a 3.8-inch sieve divided by the weight of the total sample.

The combined amount of all deleterious substances in an aggregate shall not exceed five percent of the weight of the aggregate.

If required by the Engineer, sodium sulfate soundness tests (A.S.T.M. Designation C88) shall be performed on the aggregate. When the aggregate is subjected to 5 cycles, the weight loss shall not exceed 12%. Samples of proposed aggregates shall be submitted to an independent laboratory for testing in advance of concrete work. All testing shall be performed in accordance with ASTM Designation C33. Certified test results shall be submitted to the Engineer confirming that aggregate complies with all stated specifications. Report shall identify source of aggregate and absorbed water.

b. Fine aggregate shall be well graded from coarse to fine, and shall conform to the following requirements:

	<u>Percentage by Weight</u>
Passing 3/8-inch sieve	100
Passing No. 4 sieve	95-100
Passing No. 8 sieve	80-100
Passing No. 16 sieve	50-85
Passing No. 30 sieve	25-60
Passing No. 50 sieve	10-30
Passing No. 100 sieve	2-10

Gradation of fine aggregate shall be reasonably uniform and not subject to the extreme percentages of gradation specified above. The fineness modulus shall be not less than 2.3 or more than 3.1 nor shall the fineness modulus of the representative sample used in proportioning the concrete.

If required by the Engineer, fine aggregate shall be subjected to the color-metric test for organic impurities (ASTM C40) and shall not produce a color darker than Figure 1, unless they pass the mortar strength test. Aggregate producing color darker than Figure 2 shall not be used in any event.

c. Coarse aggregate shall be well graded from coarse to fine, and when tested by laboratory sieves having square openings, shall conform to the following requirements:

	Percentage by Weight <u>Aggregate</u>	
	<u>3/4-inch Stone</u>	<u>1-1/2 inch Stone</u>
Passing 2-inch sieve	---	100
Passing 1-1/2 inch sieve	---	90-100
Passing 1-inch sieve	-100	20-55
Passing 3/4-inch sieve	90-100	0-15
Passing 3/8-inch sieve	20-55	0-5
Passing No. 4 sieve	0-10	---
Passing No. 8 sieve	0-5	---

The 3/4-inch aggregate shall be used in concrete members no thinner than 4-inches and less than ten inches thick. Proper proportions of 3/4-inch and 1-1/2 inches aggregate shall be used in members 10-inches thick and thicker. When members thinner than 10-inches are placed monolithically with members thicker than 10-inches, the aggregate requirements for the thinner member shall apply.

d. Aggregates must be allowed to drain for at least 12 hours before being used. The ground upon which aggregates are stored must be hard, firm, well drained and free from all vegetable matter. Various sizes of aggregates must be stored separately, and if they have become contaminated or merged with each other, they shall not be used.

3. Water

Water used in mixing concrete shall be clean and free from injurious amounts of oil, alkali, organic matter or other deleterious substances.

4. Admixtures

a. Water Reducing Admixture shall be Pozzolith by Master Builders Company, WRDA 15 by Grace or equal. Water reducing admixture shall conform to ASTM C494, Type A. Water reducing admixture shall not reduce durability, shall increase strength 10% and shall not affect bleeding characteristics over reference mix.

b. Air Entraining Admixture shall be equal to MBAE 10 by Master Builders, Darex by Grace Construction Products or equal. Air entraining admixture shall conform to ASTM C260.

c. No other admixture will be allowed without written approval of the Engineer. All admixture shall be compatible with cement, aggregate, and water used. Contractor shall submit to the Engineer brand, type, principal ingredient, and amount of each admixture to be used.

C. Proportioning

1. The proportions of aggregate to cement shall be such as to produce a workable mixture which can be thoroughly compacted and which will work readily in the forms and around reinforcement without permitting materials to segregate or excess water to collect on the surfaces. The combined aggregates shall be such that when separated on the No. 4 sieve, the weight passing the sieve shall not be less than 30% nor greater than 50%. The mix used is subject to the approval of the Engineer and shall be varied at his direction. No extra compensation will be allowed the Contractor for such changes.

2. Concrete of various classes shall have the following maximum total water contents and minimum compressive strengths at 28 days:

<u>Class</u>	<u>Maximum Water Content-Gallons per sack</u>	<u>Minimum 28 Day Strength-Pounds per square inch</u>	<u>Minimum Cement Content-Sacks per cubic yard</u>
A	5.5	4,500	6.5
B	5.5	4,000	6.0
C	6.0	3,500	5.5
D	6.0	3,000	5.5
X	---	2,000	4.0

Except as otherwise indicated on the drawings or specified, all concrete shall be Class B concrete (see Section 0331.B).

3. All concrete mixes shall be designed for a strength of 15% above that specified to allow for job variations. All mixes shall be designed in accordance with ACI 211.1 by a competent concrete engineer or competent laboratory technician. Required materials test data shall be submitted with design mixes for review and approval by the Engineer. See Section 0330.P. for required submittal information. Mix computations shall be submitted if requested by the Engineer.

4. The slump for all concrete shall be 3-inches and concrete with a slump within the range of 2 to 3-1/2 inches will be acceptable unless otherwise stated.

5. A water reducing admixture shall be used in all concrete. A qualified representative of the manufacturer shall be available to assist in proportioning the concrete, advise on the proper addition of the admixture to the concrete, and advise on adjustments of concrete proportions to suit job conditions.

6. An air-entraining admixture shall be used in all concrete. Air content shall be tested by the pressure method as outlined in ASTM C231 and shall be between four to seven percent by volume.

7. The Contractor shall submit to the Engineer compressive strength of concrete cylinder test results for the same concrete mixes proposed on a previous project. If this information is not available, one cubic yard trial batches of each individual mix proposed for use shall be made prior to use in the work. Four test cylinders shall be made for each trial batch, two to be tested at 7 days and operations so that the results of the 7 day tests can be obtained. All costs for material, equipment and labor incurred during design of concrete mixes shall be borne by the Contractor.

8. All aggregates shall be measured by weight. The concrete mixer is to be equipped with an automatic water measuring device which can be adjusted to deliver the desired amount of water. All measuring, mixing, and proportioning equipment is subject to the approval of the Engineer.

D. Mixing

1. Ready-mixed concrete shall be batched, mixed and delivered in accordance with ASTM C94 and ACI 304 from an approved batching plant. Concrete that is completely mixed in a truck mixer shall be mixed 70 to 100 revolutions at the mixing speed designated by the truck manufacturer. concrete shall be delivered and discharged within 1-1/2 hours or before the drum has revolved 300 times after introduction of water to the cement and aggregates, or the cement to the aggregates. Truck mixers shall be equipped with drum revolution counters. In no event shall concrete which has taken its initial set be allowed to be used. Retempering of concrete is not permitted.

An inspector representing the Engineer will be at the batching plant whenever necessary to check the batching and mixing.

2. No water shall be added on the job unless authorized by the Engineer; the amount of water, if added, shall be recorded on all copies of the delivery tickets. If water is permitted to be added to mixed concrete at the job site, an additional mixing of 30 revolutions of the drum is required.

3. Concrete shall have a temperature not less than 60°F nor more than 80°F as delivered to the job site.

4. With each load of concrete the Contractor shall obtain delivery tickets and shall make these tickets available for inspection by the Engineer. Delivery tickets shall provide the following information:

- a. Date.
- b. Name of ready-mix concrete plant, job location, and Contractor.
- c. Type of cement and admixtures, if any.
- d. Specified cement content in sacks per cubic yard of concrete and approved concrete mix number or designation.
- e. Amount of concrete in load, in cubic yards.
- f. Water added at job, if any.
- g. Truck number and time dispatched.
- h. Number of mixing drum revolutions.

5. For job mixed concrete, all concrete materials shall be mixed in a machine batch mixer for at least 1-1/2 minutes after all ingredients are in the mixer and shall continue until there is a uniform distribution of the materials and the mass is uniform in color and homogeneous. The mixer shall not be loaded beyond the capacity given by the manufacturer, and shall be rotated at the speed recommended by the manufacturer. The mixer is to be provided with positive timing device which will positively prevent discharging the mixture until the specified mixing time has elapsed.

E. Joints

1. The Contractor shall place all joints as shown on the drawings or specified herein. If approved by the Engineer, the Contractor may, at his own expense, place construction joints in addition to and at places other than those shown on the drawings. Unless otherwise shown, all joints shall be straight, truly vertical or horizontal, and proper methods shall be employed to obtain this result.

2. Where joints are not shown on the drawings or specified elsewhere, the contractor shall provide joints as follows:

a. Walls shall have vertical joints at 30-feet on center maximum but not more than 15-feet from corners or intersections and shall have horizontal joints at 15-feet on center maximum.

b. Slabs shall have joints at 20-feet on center maximum in each direction.

3. Immediately after completion of the first pour at a joint, the concrete surface, reinforcement, and waterstop projecting beyond the joint shall be thoroughly cleaned and laitance removed. The waterstops shall not be disturbed after the concrete in the first pour at a joint has set. concrete around water stops shall be thoroughly compacted b hand spading and vibrating. Immediately before the second pour, all extraneous matter shall be

removed from the joint, the waterstop and steel cleaned and the surface thoroughly wetted.

4. Concrete at all joints shall have been in place at least 24 hours before abutting concrete is placed. At least 2 hours must elapse after depositing concrete in columns or walls before depositing in beams, girders, or slab supported thereon. Beams, girders, brackets, column capital and haunches shall be considered as part of the floor system and shall be placed integrally therewith (see paragraph 0330.-H7).

5. Waterstops shall be PVC as manufactured by W.R. Meadows, Inc., Grace Construction Products, Greenstreak, Vulcan, or equal. They shall be installed in accordance with the manufacturer's suggested procedures. Water stop at expansion joints shall be Vulcan 8018 or equal with tear web and u-bulb.

Waterstops shall be made continuous by splicing. Waterstops shall be spliced using a corner, tee, or cross splice as applicable at intersections. Waterstops shall be mitered to maintain the continuity of the ribs and center bulb. Splices shall be made using a hot metal plate or an electric splicer and full butt weld. Direct flame will not be allowed. Sample field splices shall be submitted to the Engineer for approval prior to construction.

Waterstops placed in all joints shall be securely held in place by an approved method or as shown on the drawings. No nails will be permitted through the water-stop. Great care shall be taken when concrete is placed to insure that the waterstop remains erect and is not bent over.

6. Where shown on the drawings, expansion joints shall have standard 1/2-inch thick cork expansion joint filler; Grace, W.R. Meadows, or equal; meeting ASTM D1752 - Type II. Exceptions to this are expansion joints in exterior concrete walks and between concrete walks and other structures which shall be asphalt expansion joint filler, 1/2-inch thick; Grace, W.R. Meadows, or equal; meeting ASTM D994.

F. Bonding to Existing Concrete

1. When placing new concrete adjacent to existing concrete, the existing concrete shall be thoroughly roughened, cleaned and saturated with water 24 hours before pouring new concrete. At time of new pour, remove any standing water and a bonding agent equal to THOROBOND by Standard Dry Wall Products, Inc., Sonocrete by Sonneborn Contech Co., or equal shall be applied in accordance with manufacturer's recommendations.

2. When patching existing concrete, remove poor concrete until firm hard concrete is exposed, roughen and clean surface of the existing concrete and clean any exposed reinforcing bars, and pour new concrete. Concrete finish to match existing concrete. New concrete shall be 4,000 psi 28 days strength mixed with ACRYL 60 by Standard Dry Wall Products, Inc., Sonocrete by Sonneborn Contech Co., or equal, mixed according to manufacturer's instructions.

G. Embedded Items in Concrete

1. All sleeves, inserts, anchors, and embedded items required for adjoining work or for its support shall be placed prior to concreting.
2. All contractors whose work is related to the concrete or must be supported by it, shall be given ample notice and opportunity to introduce and/or furnish embedded items before the concrete is placed.
3. Embedded items shall be positioned accurately and supported against displacement. Reinforcing bars shall clear embedded items a minimum of 2-inches.

H. Placing Concrete

1. Before placing concrete, all equipment, forms, ground, reinforcements, and other surfaces with which the concrete will come in contact are to be thoroughly cleaned of all debris, ice, and water. Ground shall be wetted prior to placement of concrete on it.

Unless otherwise authorized by the Engineer, all concrete shall be placed in the presence of the Engineer.

2. Concrete shall be conveyed from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent the segregation or loss of materials. Chuting concrete directly into the form will not be allowed. Chuting for conveying purposes will be allowed only upon approval by the Engineer, and must be accomplished in such a manner as to prevent segregation or loss of materials. Receiving hoppers shall be installed at the chute discharge and at no point in its travel from the mixer to place of final deposit shall the concrete pass through a free vertical drop of more than 3-feet. Elephant trucks or tremies shall be used in all wall pours to prevent coating of forms and reinforcing bars.
3. Care shall be taken to avoid an excess of water on the concrete surface. Excess water shall be drained or otherwise removed from the surface. Dry cement or a mixture of cement and sand shall not be sprinkled directly on the surface to absorb water.
4. Concrete in wall and beam pours shall be deposited in approximately horizontal layers not to exceed 18-inches in thickness. Each layer shall be well worked into the preceding layer while both layers are still soft.
5. Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. The maximum allowable lateral movement of the concrete after being deposited is three feet. When concreting is once started, it shall be carried on as a continuous operation until the placing of the section or panel is completed.

6. All concrete shall be placed with the aid of mechanical vibrating equipment in accordance with ACI 309 and as approved by the Engineer. In congested areas vibration shall be supplemented by hand spading adjacent to the forms. Vibration should secure the desired results within 5 to 15 seconds at intervals of 18-inches apart maximum. The vibrator shall penetrate the preceding layer of concrete. Vibrators shall have a frequency of not less than 10,000 impulses per minute when in operation submerged in concrete.

A sufficient number of spare vibrators shall be kept in ready reserve to assure adequate vibration in case of breakdown of those in use.

7. In placing concrete in beams where it is intended to be continuous and monolithic with the slab above, a delay to provide for settlement of the deep concrete shall be scheduled before placing the upper concrete in the slab. The length of delay shall be as long as possible and still permit the re-vibration of the deep concrete.

8. Concrete is not to be placed under water. A suitable means shall be provided for lowering the water level below surfaces upon which concrete is to be placed. This may require excavating approximately 12-inches below the bottom of the concrete surface and refilling with gravel, and compacting. The groundwater shall not be allowed to rise to the bottom of the concrete until 24 hours after the concrete pour has been completed. Water shall not be allowed to fall upon or run across the concrete during this period.

No extra payment will be allowed for dewatering, undercutting, and gravel fill.

I. Moist Curing

1. All concrete shall be maintained in a moist condition for at least 7 days after being deposited, except that for high-early strength concrete a 3 day period will be sufficient. Moist curing shall be accomplished by one of the following methods as directed by the Engineer:

a. Wood forms left in place and kept wet at all times. If the forms are not going to be kept wet, they shall be removed as soon as practicable and other methods of moist curing shall be started without delay.

b. Use of a curing compound conforming to ASTM C309, Type I as approved by the Engineer. Curing compound shall be applied at a uniform rate as indicated by the manufacturer sufficient to comply with the requirements of the test water retention of ASTM C156-65. Curing compound applied to vertical concrete surfaces after forms are removed shall be specially adapted to provide required coverage on the vertical surface. On non-formed surfaces the curing compound shall be applied immediately after the disappearance of the water sheen after finishing of the concrete. Curing compound shall not be used on concrete surfaces which are to be painted, received ceramic tile or resilient flooring, or be waterproofed unless

approved by the Engineer. Care shall be taken not to get curing compound on construction joints, reinforcing steel and other surfaces which new concrete will be poured against.

c. Use of plastic film. Plastic film shall have a minimum thickness of 4 mils. It shall be placed over the wet surface of the fresh concrete as soon as possible without marring the surface and shall be weighted so that it remains in contact with all exposed surfaces of the concrete. All joints and edges shall be lapped and weighted. Any tears in the film shall be immediately repaired.

d. Application of wet coverings weighing 9 ounce per square yard such as burlap, cotton mats, or other moisture-retaining fabrics. The covering system shall include two layers and shall be kept continuously moist so that a film of water remains on the concrete surface throughout the curing period.

e. Use of an approved waterproof curing paper. Edges of adjacent sheets shall be overlapped several inches and tightly sealed.

f. Ponding of water or continuous sprinkling of water is permitted. Sprinkling at intervals will not be permitted.

g. Construction joints shall be moist cured by one of the methods listed above except by Method "b".

The use of moist earth, sand, hay, or an other method that may discolor hardened concrete will not be permitted.

J. Hot Weather Concreting

1. When the atmospheric temperature exceeds 80°F during concrete placement, this section and ACI 305 shall apply in addition to all other sections of the specifications.

2. The temperature of the delivered concrete shall not exceed 85°F.

3. Care shall be exercised to keep mixing time and elapsed time between mixing and placement at a minimum. Ready-mix trucks shall be dispatched so as to avoid delay in concrete placement and the work shall be organized to use the concrete promptly after arrival at the job site.

4. The subgrade, forms and reinforcing shall be sprinkled with cool water just prior to placement of concrete. Prior to placing concrete, there shall be no standing water or puddles on the subgrade.

5. If approved by the Engineer, an admixture for retarding the setting of the concrete may be used.

6. Exposed concrete surfaces shall be carefully protected from drying. Continuous water curing is preferred. Curing compounds shall be white pigmented.

K. Cold Weather Concreting

1. Conditions of this section shall apply in addition to all other sections of the specifications when placing concrete in cold weather. Cold weather is defined as a period when for more than three successive days the average daily temperature drops below 40°F. When temperatures above 50°F occur during more than half of any 24 hour period, the period will no longer be regarded as cold weather. The average daily temperature is the average of the highest and lowest temperature during the period from midnight to midnight. Cold weather concreting shall conform to all requirements of ACI 306.1, Standard Specification for Cold Weather, Concreting, published by the American Concrete Institute, Detroit, Michigan, except as modified by the requirements of these specifications.

2. Detailed procedures for the production, transportation, placement, protection, curing and temperature monitoring of concrete during cold weather shall be submitted to the Engineer. Cold weather concreting shall not begin until these procedures have been accepted.

3. All concrete materials, forms, ground, mixing equipment, and other surfaces with which the concrete is to come in contact shall be free from frost and the temperature of contact surfaces shall be 35°F or above. Ground upon which concrete is to be placed shall not be frozen at any depth.

4. The mixing water and aggregates shall be heated and when entering the mixer shall have temperatures not exceeding 175°F, and 80°F, respectively. concrete temperature as mixed shall not exceed 80°F and shall typically be between 55°F and 70°F. Concrete, when placed in the forms, shall have a temperature of not less than 50°F.

5. Freshly placed concrete shall be protected by adequate covering, insulating, or housing and heating. If heating is used, ambient temperature inside the housing shall be maintained at a minimum of 70°F for 3 days or 50°F for 5 days. The maximum ambient temperature during curing shall not exceed 80°F. If insulating methods are used, recommendations contained in ACI 306R-78 shall be followed. Surface temperature shall be maintained at 50°F for 7 days. After the curing period, the temperature of the concrete shall be reduced uniformly at a rate not to exceed 40°F per 24 hours until outside air temperature is reached. Heating of enclosure shall continue if it is anticipated that the outside air temperature will drop more than 20°F in the next 24 hours. The concrete temperature shall be obtained by attaching a thermometer provided by Contractor to the concrete surface. Concrete shall be kept moist in accordance with Section 0330-I.

6. If heating is used, the housing shall be constructed weathertight and shall be constructed in a manner that will provide uniform air circulation and air temperatures over the complete concrete area that is being cured. Special attention shall be given to the edges and ends of a concrete pour with the housing extending at least 5 feet beyond any concrete surface being protected. The housing shall be in place and heat applied within 2 hours after concrete placement.

7. Heating may be by steam or hot air. Heaters shall be vented to outside of the housing. Open burning salamanders will not be permitted. Heating devices shall not be placed so close to the concrete as to cause rapid drying or discoloration from smoke.

8. If heating is used, the Contractor shall provide sufficient 24-hour inspection of the heaters to insure compliance with the above specified temperature requirements during the curing period. The Contractor shall provide maximum-minimum thermometers to be placed as directed by the Engineer.

9. The use of calcium chloride, salts, or other chemical admixtures for the prevention of freezing is prohibited.

L. Finishing

1. Flat Work

a. The top surfaces of floor slabs and walls shall be screened, floated, and steel trowelled to a smooth, dense finish. Sprinkling water on the plastic concrete surface is not permitted. Check and level the surface plane to a tolerance not exceeding 1/4-inch when tested with a ten foot long straight edge in any direction. Straight edge shall be furnished by the Contractor.

Floating shall not begin until the water sheen has disappeared, and/or until the concrete has stiffened sufficiently to permit the proper operation of a power-driven float. Steel trowelling shall then be done in such a manner that no water or excess fine material is brought to the surface. The finished surface shall be free of any trowel marks and shall be uniform in texture and appearance.

b. Sidewalks, exterior slabs and other surfaces where specified shall be given a transverse scored texture by drawing a fiber bristle broom across the surface perpendicular to main traffic route. This operation shall follow trowelling.

2. Formed Surfaces

a. Within two days after removing forms, and prior to application of a curing compound, all concrete surfaces shall be inspected and any poor joints, voids, stone pockets or other defective areas shall be patched at once before the concrete is

thoroughly dry. Defective areas shall be chipped away to remove all loose and partially bonded aggregate. The area shall be thoroughly wetted and filled with as dry as practical mortar mix place, the excess mortar shall be removed flush with the surface on the concrete using a wood float. All patching shall be cured, protected, and covered as specified for concrete. All cracks, leaks or moist spots which appear shall be repaired to the satisfaction of the Engineer. No extra compensation will be allowed the Contractor for such work.

b. Tie rod holes left by the removal of the exterior portion of the tie and cone shall be thoroughly wetted and filled by ramming with as dry as practical mortar mix in such a manner as to insure complete filling of the hole. Mortar shall include a bonding agent in accordance with Section 0330. F. 2. All patching shall be cured, protected, and covered as specified for concrete. The holes are to be filled immediately after removal of the exterior portion of the tie.

c. All concrete surfaces shall have all fins, burrs, etc., removed by grinding, wire brushing, or chipping off with a hammer. All concrete surfaces shall be left in a smooth condition acceptable to the Engineer.

d. All concrete surfaces which will remain exposed or painted shall be rubbed. Exposed concrete surfaces in open tanks and channels shall be rubbed to one foot below finish grade and to one foot below normal water level. Rubbing shall consist of first dampening the surface, then filling all voids on the surface with a cement and sand mortar using a rubber float. Mortar shall include a bonding agent in accordance with Section 0330. F. 2. The excess mortar shall then be removed from the surface by rubbing the surface with burlap.

3. All precautions shall be taken to protect the concrete from stains or abrasions and any such damage shall be removed or repaired under this contract.

M. Loading of Concrete Structures

1. No concrete structure or portion thereof shall be loaded with its design load until the concrete has obtained its specified 28 day compression strength. This shall include but not be limited to vertical live load, equipment loading, water loading, groundwater loading, and backfill load. Concrete strength at time of loading shall be determined by testing field cured concrete cylinders.

2. Extreme care shall be taken to insure that construction loads do not exceed design loading of the structure.

N. Non-Shrinking Cement

Non-shrinking, non-metallic mortar, Crystex by L & M Chemical, or equal, shall be used for

DIVISION 4 - MASONRY

0401. SCOPE

- A. Applicable provisions of Division 1 shall govern work in this section.
- B. This section includes all masonry work required on this Project with the exception of any designated work to be done by others.

C. Work Included:

- 0401. Scope
- 0426. Existing Masonry

0426. EXISTING MASONRY

- A. Where possible new openings in existing masonry shall be sawcut.
- B. Provide all necessary removals and repairs required for installation of pipe openings.
- C. Repair all masonry damaged during construction as approved by the Engineer.

DIVISION 5 - METALS

0501. SCOPE

- A. Applicable provisions of Division 1 shall govern work in this section.
- B. In general, this section includes specifications for structural steel, aluminum, and all miscellaneous metals required for construction of this project.
- C. Work Included:

0501.	Scope
0508.	Stainless Steel
0509.	Structural Steel
0511.	Shop Paint
0523.	Expansion Bolts

0508. STAINLESS STEEL

- A. Unless otherwise noted, all stainless steel shall meet the requirements of ASTM 176 and shall be Type 304.
- B. If components are not available in Type 304, other 300 series type shall be used as approved by Engineer.

0509. STRUCTURAL STEEL

All structural steel shall conform to ASTM Designation A36 and fabrication and erection shall be in accordance with AISC specifications for fabrication and erection of structural steel for buildings. All steel tubes shall be ASTM A500 Grade B. All steel pipe columns shall be ASTM A53 Grade B. Welding shall be done by the shielded arc process and as recognized as good practice by the American Welding Society. E70XX electrodes shall be used. All welds shall be chipped, ground smooth and primed immediately after fabrication. All welding shall be performed by an AWS certified welder. All bolts shall conform to A307, unless otherwise noted.

0511. SHOP PAINT

All steel not galvanized shall have surface preparation and shop coat of paint, all in accordance with the painting specifications.

0523. EXPANSION BOLTS

- A. Expansion bolts shall be Hilti Kwik-Bolts, or equal.

B. Unless otherwise noted on the drawings, edge distance and spacing shall be in accordance with the manufacturer's recommendations.

C. Hole shall be same diameter as expansion bolt. Bolt embedment shall at least equal six bolt diameters.

D. Unless indicated otherwise on the plans or specified, use the following bolt material for the various installation situations:

1. Stainless Steel - For all submerged locations, below final grade, and in contact with aluminum appurtenances and other items not to be painted.

2. Steel - In other locations in contact with items to be painted or encased in concrete.

DIVISION 9 - FINISHES

0901. SCOPE

- A. Applicable provisions of division 1 shall govern work in this section.
- B. In general, this section includes paint applied to new and existing construction. Painting by the Contractor shall include all work done by all trades.
- C. Work Included:

0901.	Scope
0990.	Painting

0990. PAINTING

A. Paint

All materials required for painting shall be brands and quality as manufactured by Tnemec Company, Inc., Glidden Coatings and Resins, or equal, and shall be delivered to the site in original containers with labels intact and seals unbroken.

All materials shall be used as specified by the manufacturer's label directions, with examination of work on the site by the manufacturer's representative, if requested by the Engineer.

Paint and paint products of Tnemec Co., and Glidden Coating and Resins, mentioned in the following specifications, are set up as standard of quality. Other manufacturer's products will be acceptable if the Contractor and paint manufacturer certify that the products offered are recommended for the service intended, are compatible with the shop primers used, are equal in solids content and composition, and are of the same type. Submittal shall include the following performance data as certified by a qualified testing laboratory.

1. Abrasion - Fed. Test Method No. 141, Method 6192, CS-17 Wheel, 1,000 grams load.
2. Adhesion - Elecometer Adhesion Tester (ASTM D4541-85).
3. Exterior Exposure - Exposed at 45 degrees facing the ocean, (South Florida Exposure).
4. Hardness - ASTM D3363-74.
5. Humidity - ASTM D2247-68.

6. Salt (Fog) Spray - ASTM B117-73.

7. Dielectric Strength - ASTM D149.

All paints shall be lead and zinc chromate free. Paints listed in the schedule contain lead in certain colors. If these colors are selected, the Contractor shall substitute a paint of equal quality which is lead free. Shop primers shall be compatible with finish coats. Both primer and finish coat manufacturers shall certify compatibility.

Submit three copies of manufacturer's safety data sheets for each type of paint.

B. Coverage

See the painting schedule for coverage and thickness.

The coatings listed will provide the mil thickness given when applied at the coverages listed. Upon the request of the Engineer, such surfaces shall be checked by the painter with a mil thickness gauge and any deficiencies found in the film shall be remedied by additional cost(s) at the expense of the Painting Contractor.

C. Thinners

Where thinning is necessary, only the products of the manufacturer furnishing the paint, and for the particular purpose, shall be allowed, and all such thinning shall be done strictly in accordance with the manufacturer's instructions, as well as with the full knowledge and approval of the Engineer.

D. Surface Preparation

All surfaces to be painted shall be prepared in a workmanlike manner with the objective of obtaining a smooth, clean and dry surface. No painting shall be done before the prepared surfaces are approved by the Engineer, and surfaces painted without such approval shall be sandblasted clean and repainted.

All existing areas damaged during construction and requiring repainting shall be inspected by the Contractor, Engineer and paint manufacturer's representative with surface preparation determined in accordance with manufacturer's recommendations.

Metal - All ferrous metal to be primed in the shop shall have all rust, dust, and scale, as well as all other foreign substances, removed by sandblasting or pickling. Cleaned metal shall be primed or pretreated immediately after cleaning to prevent new rusting. All ferrous metals not primed in the shop shall be sandblasted in the field prior to application of the primer, pretreatment or paint. Sandblasting in the shop and in the field shall be sandblasted to application of the primer, pretreatment or paint. Sandblasting in the shop and in the

field shall be sandblasted to near white grade SSPC Specification No. 10. Prior to finish coating, all primed areas that are damaged shall be cleaned and spot primed. All non-ferrous metals shall be solvent cleaned in accordance with SSPC Specification No. 1.

Concrete - All concrete surfaces to be painted shall be cleaned of all form oil, curing compound and other foreign matter. All concrete walls and floors shall be etched by acid solution and/or brush-off blast cleaning in order to prepare the surfaces for adherence of the painting systems as specified. Resulting surface shall have a toothed or grainy texture. Paint manufacturer shall inspect and approve the surface preparation method and the prepared surface prior to painting. After acid etching or blast cleaning the surface shall be washed and all dust, sand and loose particles shall be removed by vacuuming or blowing off with high pressure air. All concrete ceilings, cast-in-place and precast, shall be washed with a high pressure water blast.

Wood - Wood surfaces shall be thoroughly cleaned and free of all foreign matter with cracks and nail holes and other defects properly filled and smoothed. Wood trim shall be sandpapered to a fine finish and wiped clean of dust.

Surface preparations listed above are considered a minimum. If paint manufacturer requires a better preparation for a particular application, it shall be considered a part of this specification.

E. Application

The Contractor shall heat and ventilate to obtain dry conditions recommended by the manufacturer. Relative humidity conditions as specified by the manufacturer's data sheet shall be adhered to even when supplemental heat is used. No paint shall be applied on a wet or damp surface, and in no case until the preceding coat is dry and hard. Each coat shall be allowed to dry in accordance with manufacturer's data sheets before the next coat is applied. No exterior painting shall be undertaken when damp weather appears probable, nor when the temperature of the substrate is below 55°F, unless heated temporary enclosure is provided.

Drying time shall be construed to mean "under normal conditions". Where conditions are other than normal because of the weather or because painting must be done in confined spaces, longer drying times will be necessary.

Additional coats of paint shall not be applied, nor shall units be returned to service until paints are thoroughly dry and cured.

Steel that will be inaccessible in the completed work shall receive the final coat before enclosure.

Paint shall be applied to provide an opaque, smooth surface of uniform finish, color,

appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags or other surface imperfections will not be acceptable.

F. Protection of Work

Drop cloths shall be used in all areas where painting is done to fully protect other surfaces.

Oily rags and waste must be removed from the building each night or kept in an approved metal container.

All stains and marks shall be removed from other surfaces upon completion of the work.

G. Workmanship

After completion of painting, the work shall be inspected by a representative of the paint manufacturer. He shall furnish a certificate that the quality of workmanship and quantity of paint used comply with the specifications and accepted standards.

At the completion of the project, all painted surfaces which have been damaged shall be repainted or touched up.

The painter shall use some discretion in what should and should not be painted. Do not paint over labels and motor information, bronze or brass, machined surfaces, moving parts where painting may impair movement, hot surfaces which may peel, etc.

H. Schedule

All new work done by all trades shall be painted by the Contractor in accordance with the following schedule. All painting shall be done in accordance with paint manufacturer's recommendation and the following schedule. If any new items of construction are not listed, the Contractor shall request paint system from the Engineer.

1. Cast or ductile iron, not tar coated, not submerged or buried - One shop coat 66-1255 Epoxy Primer; one coat 104 High Solids Epoxy semi-gloss indoors; one coat 104 High Solids Epoxy and one coat of 73 Endura Shield outdoors; or one shop coat Glidden 5461 Epoxy Metal Primer; one coat 5430 Epoxy indoors; one coat 5430 Epoxy and one coat 6200 urethane exterior.

2. Steel, machinery, and equipment not submerged, interior of buildings, one shop coat Tnemec 66-1255 Epoxy Primer, one coat Tnemec 104 High Solids Epoxy semi-gloss, or one shop coat Glidden 5461 Epoxy Metal Primer and one coat 5430 Epoxy. If not shop coated, field sand blast, and apply two coats 104 High Solids Epoxy semi-gloss or one coat Glidden 5461 Epoxy Metal Primer and one coat 5430 Epoxy.

3. Steel, machinery and equipment, not submerged, exterior - One shop coat Tnemec 66-1255 Epoxy Primer, one coat 104 High Solids Epoxy semi-gloss, one coat 73 Endura Shield, or one shop coat Glidden 5461 Epoxy Metal Primer, one coat 5430 Epoxy, one coat 6200 Urethane.

I. Repainting and Painting of Existing Construction

All existing construction, piping and equipment in the existing buildings which is damaged or repaired by construction shall be painted to match existing materials as approved by Engineer.

J. Coverage

<u>Inemec Product</u>	<u>Sq. Ft.** Coverage</u>	<u>Dry Mil Thickness/Coat</u>
104-Color High Solids Epoxy	164	8.0
66-1255 Epoxy Primer	225	4.0
73 Endura-Shield III	465	2.0
<u>Glidden Product</u>		
5430	160	6.5
5461	220	4.0
6200	520	1.5

** No allowance made here for waste in handling, mixing or application.

K. Colors

Piping colors are to be selected by the Engineer.

DIVISION 11 - GRANULAR ACTIVATED CARBON TREATMENT SYSTEM

1101. SCOPE

A) Applicable provisions of Division 1 shall govern work in this section. Refer to bidding section for specific bidding requirements for this system.

B) Table of Contents

- 1101. Scope
- 1102. Bid Submittals
- 1103. Shop Drawing Submittals
- 1104. G.A.C. Process Description
- 1105. Equipment
- 1106. Granular Activated Carbon
- 1107. Start-up Services
- 1108. Warranty
- 1109. Award

C) Description of Work Items

This specification describes all equipment materials and services necessary to provide a completely installed Granular Activated Carbon (G.A.C.) Adsorption System at Unit Well No. 35. The adsorption System shall consist of multiple skid mounted treatment units and all related appurtenances required for a completely installed and operational system. The total system must be designed for economical carbon usage and ease and completeness of Granular Activated Carbon transfers.

The Carbon Adsorption System Supplier must take unit responsibility for the completely installed system. The Supplier shall be responsible for design, fabrication, installation and startup of all mechanical components including, but not limited to, vessels, piping, and instrumentation. The Supplier shall also be responsible for supply, delivery and hydraulic loading of virgin grade fresh Granular Activated Carbon. Supplier shall be able to offer services for unloading and environmentally approved disposal of the spent carbon. Removal and disposal of spent carbon must be in accordance with all applicable local, state, and Federal Regulations regarding solid waste materials.

The Carbon Adsorption System Supplier shall be able to guarantee a supply of virgin grade Granular Activated Carbon and verify the quality of such material with lot analyses of all shipments. This quality shall be in full compliance with the specification herein for Granular Activated Carbon. The Supplier shall also be able to remove and transport spent Granular Activated Carbon classified as hazardous under RCRA regulations, so that it can be transported to a reactivation facility as required. The adsorption system shall be designed and constructed using materials suitable for food grade applications or potable water use meeting requirements of AWWA standards.

2) Design

The total system shall contain a minimum installed capacity of 20,000 pounds of Granular Activated Carbon per vessel indicated on the plans. Overall system design flow per vessel will be up to 700 gpm at a total pressure drop of less than or equal to 10 psi with the vessels operated in parallel. A maximum system pressure drop of 10 psi with clean water and clean carbon bed -- following backwash/backflush will be measured beginning with the influent piping and ending with the effluent piping at the treatment area. The system shall be designed to treat all waters equal to or above pH 7, or that are otherwise not corrosive to carbon steel material.

Design flow rate for Well 35 shall be ----- gpm.

Limits for the Adsorption System shall be defined as beginning at the influent connection for the system and ending with the effluent connection for the system in the treatment area as indicated on the plans. All equipment and piping between these two points shall be provided as part of the complete design by the G.A.C. Supplier.

D) Work Included

The work covered by this specification includes the furnishing and installation of all equipment, materials, carbon and services to comprise a complete Adsorption System for both sites, as indicated on the plans.

1. Multiple downflow adsorbers as indicated on the plans, including a water collection system and all internals. Adsorbers shall be ASME code vessels, with a corrosion resistant lining where GAC contacts the steel.

2. Influent and effluent piping properly sized (10 fps velocity maximum) to the adsorber vessels and interconnecting pipe and valves to allow adsorbers to be operated in parallel (or in series as a pair of adsorbers). Valving shall be able to isolate any adsorber vessel for carbon exchange operations while maintaining operation through the remaining adsorbers.

In addition a backwash system shall be included with each adsorber system. Provide piping from each adsorber to a single point as indicated on the plans.

3. Independent Granular Activated Carbon fill and discharge piping system with valves and hose connections to facilitate carbon transfers with transfer hose. Adequate hose to be brought to site each time for all carbon transfers or provided to Owner during first shipment.

4. Integral pressure air release valves which do not permit air to enter system, vent and safety relief system, piping and utility connections. Vent piping directed to single point as shown on plans. Vent piping to be independent from carbon transfer and influent piping.

5. 20,000 pounds of Granular Activated Carbon, as specified, installed per adsorber. GAC shall be Filtrasorb 300, as manufactured by Calgon Carbon Corporation.

6. Compressed air connections at each adsorber vent line to supply motive air for carbon transfers. Connection to be 3/4" welded pipe connection with check valve, shut-off valve and "Chicago" type hose fittings.

7. Complete installation within described treatment area including:

- a. Location for anchor bolts,
- b. Air compressor or compressed air supply at proper pressure and rate provided at vent line connection and hose.
- c. Cleaning and disinfection of system prior to introduction of potable water in accordance with applicable AWWA and IEPA approved methods and procedures.
- d. All equipment and personnel required to unload and set-up carbon vessels and piping within treatment area.
- e. Support system for all piping which limits spacing to less than 10 feet between supports.
- f. Excess or backflush water disposal and truckage if necessary to disposal location.

8. Complete set of technical specification and operating manual.

9. Experienced technical assistance as required.

E) Work Not Included

The following work is not covered by this specification section and is to be the responsibility of Contract 1-91:

1. Foundations and gravel surfacing.
2. Influent supply, effluent disposition (unless otherwise noted) and utility water supply. Regulation or monitoring of water flow.
3. Freeze protection and/or insulation.

1102. BID SUBMITTAL

A) General

In order to insure the supply of a Granular Activated Carbon (GAC) Adsorption System that will be fully effective in meeting effluent requirements for a safe drinking water supply, potential suppliers of the Adsorption System shall provide the following information with the bid. These submittals shall show the ability to design and supply a GAC Adsorption

System in a timely manner, supply GAC media when required, provide safe and legal removal of spent GAC when required and provide on-going technical support.

The existing layout and specifications herein are based upon a Model 10 Adsorption System as manufactured by Calgon Carbon Corporation of Pittsburgh, PA., (412)787-6700. Substitute suppliers of "Equal" adsorption systems shall fulfill the requirements of Article 6.7 of the General Conditions and all requirements contained in this specification section.

B) Experience Qualifications

The potential system supplier shall submit the following information for five (5) existing adsorption systems which demonstrates the ability to design and supply an effective GAC Adsorption System and meet the qualifications noted above.

1. Provide Adsorption System description including flow, contact time, system design (flow diagrams or general arrangement), adsorber size.
2. Provide process design information including contaminants, system performance (operating results, actual contaminants in influent and effluent), effluent water disposition, GAC usage rates.
3. Provide references for each of the systems described.

C) GAC Adsorption System Design

The potential Adsorption System supplier shall submit the following information with the proposal, utilizing catalog cuts, standard designs or recent designs on file, for GAC adsorption systems of similar size or adaptable to this size using a minimum number of multiple units.

1. Provide adsorber vessel design drawings, showing ASME code compliance.
2. Provide underdrain design showing ability to remove water across GAC cross-section for effective use of all GAC contained in unit.
3. Provide Adsorption System flow diagram utilizing vessels above showing actual flow rates to be treated for this site.
4. Provide Adsorption System general arrangement, showing space requirements and all external piping connections.
5. Provide operating weight of Adsorption System for this site, so that when combined with information above the foundation design can be confirmed.
6. Provide field tests on adsorbers showing nearly complete removal of spent GAC (less than 5 cubic feet remaining) so that spent media remaining will not contaminate effluent

water. Adsorber design shall incorporate the feature to remove carbon without requiring the adsorber to be opened and cleaned or hosed.

D) GAC Adsorption System Process Design and Accelerated Testing

The potential supplier shall submit the following information with the proposal to exhibit capability to assume total process design capability for the Adsorption System and to actually perform accelerated column testing at each site.

1. Provide pressure drip information across system design.
2. Provide data which shows that GAC can effectively remove contaminants. Provide interpretation of data to show that system design is adequate for this service.
3. Provide a dynamic pilot simulation of field performance of the proposed system. This dynamic pilot simulation shall be a column study conducted on the actual groundwater from the treatment site. The column study will simulate the contact time to be encountered in the full-scale treatment operation and identify the carbon utilization rate in a simulation of up to one year's field performance or the time until first GAC exchange is required.
4. Provide analytical procedures used to support Items above.

E) GAC Supply

The potential Adsorption System supplier shall demonstrate ability to supply acceptable GAC media, and therefore, provide the following information with the proposal:

1. Supply specifications of GAC to be utilized in system. Show that this GAC is equivalent to that used in testing. Provide recent lot analyses that exhibit that GAC supplier is providing media according to published specifications.
2. Demonstrate ability to supply complete GAC fill in a timely manner upon system completion or notification by client. Demonstrate that inventory of GAC proposed is adequate to meet the initial fill requirements in a timely manner.
3. Demonstrate ability to transport GAC to site in a reasonable time frame and transfer GAC from delivery units into adsorbers in a safe and timely manner. Provide typical delivery trailer drawings, number of trailers, tractors and drivers currently available.. Provide delivery trailer unloading procedures. If GAC is for food grade application, provide delivery trailer lining information showing that such lining is on the FDA approved list.

F) GAC Reactivation

The potential Adsorption System supplier shall demonstrate ability to handle the spent activated carbon by nondestructive reactivation so that spent GAC can be removed from the site and handled in an environmentally safe and legally approved manner. Landfill of spent

GAC shall not be an approved manner of GAC disposition. The following information shall be required of reactivating capability and submitted with the proposal.

1. Provide reactivation testing procedures showing that the spent GAC will be received at the facility and reactivated in an environmentally safe manner.
2. Identify spent GAC transportation equipment showing transport of spent GAC in enclosed, DOT approved equipment. Provide transportation equipment drawings and necessary permits to transport hazardous waste.
3. Demonstrate ability to transport and receive RCRA manifested material. Provide facility RCRA identification numbers.
4. Provide a statement that the adsorption system supplier or provider of reactivation services ("contractor") shall, to the extent of this negligence, indemnify and hold harmless the owner for any liability that may arise after the spent carbon is loaded into contractor's trailers and signed for by contractor at the owner's facility, provided that the spent carbon contains no PCB, dioxin, DBCP or any other compounds that, due to government regulation, may preclude handling the spent carbon in a RCRA approved and permitted facility.
5. Provide a certificate of insurance evidencing sudden and accidental pollution liability of insurance of at least 6 million dollars at the reactivation contractor's reactivation site.

G) Field Support and Operating Assistance Qualifications

The potential system supplier shall submit the following information exhibiting ability to provide on-going support to the client to insure effective operation of the Adsorption System for the foreseeable future.

1. Provide analytical programs to assist on-going technical support.
2. Demonstrate ability to provide on-site support to operations. Provide per diem rate for engineering (process) support and mechanical (operations) support. Provide organization chart showing technical (operations) supports groups and resumes of key personnel in the Operations and Engineering departments.

H) Time Constraint Acknowledgement

Since time is of the essence the system supplier shall acknowledge in writing the time constraints as established by the contract document and be able to respond accordingly.

1103. SHOP DRAWINGS

A) General

Upon award of the purchase order, the Adsorption System Supplier shall submit the

following information in the time and manner specified. Information provided by the supplier that is considered by the supplier to be confidential in nature must be clearly marked and so designated.

B) Approval Submittal

After award the following submittals shall be made:

1. Project schedule indicating submittals, equipment delivery, installation and start-up.
2. Flow schematic drawing indicating line sizes, valving, utility line sizes and connections.
3. Vessel drawings.
4. Equipment arrangement and weights - detailed drawings(s) and listing of all required anchor bolts and a dimensional setting plan to conform to the requirements of the furnished equipment.

C) Construction Submittal

After return of approved first submittal to the supplier, the following submittals shall be made:

1. General arrangement plans and elevations including detail and location of required interface connection to the system.
2. Bill of materials for specialty items, and specification for piping and other items.
3. List of any extra materials supplied with equipment.
4. List of recommended spare parts and special tools.

D) Operating Manual Submittal

Prior to delivery and start-up of the system, the following submittals shall be made:

1. Operating and maintenance manual incorporating all necessary information from previous submittals. Operating section shall include complete instruction on unloading spent carbon and loading fresh virgin grade carbon, including any auxiliary utilities required.
2. Names, functional titles, addresses and phone numbers of technical personnel available for on-going technical support.

E) As-Built Submittal

After start-up and final system acceptance the following submittals shall be made:

1. Complete set of drawings and final bill of materials and specifications.
2. Manufacturer's data sheet for all adsorber vessels.

1104. GAC PROCESS DESCRIPTION

A) Carbon Adsorption

The Adsorption System utilizes Granular Activated Carbon (GAC) for efficient removal of dissolved organic compounds from water intended for potable use. Adsorption is a physical process in which the compounds adhere to the surface of the carbon particles. The large surface area contained within the internal pore structure of the granular carbon particle provides the Carbon Adsorption System with a substantial capacity for the organic compounds to be removed. The Adsorption System provides effective exposure of the contaminated water to a quantity of Granular Activated Carbon.

The Granular Activated Carbon Adsorption System shall consist of multiple skid mounted process vessels (adsorbers) operated in parallel. Each adsorber will contain twenty thousand pounds (20,000#) of Granular Activated Carbon (GAC). Water shall be conveyed to the Adsorption System from the source, enter the adsorbers at the top and flow downward through the carbon bed. An internal collector system shall be provided to collect the treated water and retain the granular media in the bed. The treated water is discharged from the Adsorption System through the effluent piping.

The Adsorption System design shall provide for a contact time of ten (10) minutes given a flow of 500 gpm through each adsorber vessel. The contact time is calculated on a "superficial" or "empty bed contact time" basis. The pressure drop across the entire Adsorption System shall be <10 psig during parallel operation.

B) Carbon Exchange

When the carbon in an adsorber becomes saturated with contaminants adsorbed from the water, this vessel shall be taken out of service to replace the spent Granular Activated Carbon with virgin grade Granular Activated Carbon. The flow can be diverted to the remaining adsorbers allowing the treatment system to remain in service. The adsorber is pressurized with compressed air and the spent carbon is displaced into transfer tank or receiving trailer. The bottom of the carbon bed shall be contained in a coned section, so that nearly complete removal of the spent carbon is possible in a single step. Fresh carbon can be transferred as a slurry from a delivery contained to the empty adsorber utilizing pressure or an educator system. The now empty delivery container can receive the spent carbon from the transfer tank for removal from the site.

After the adsorber has been recharged, the adsorber receiving the virgin grade carbon shall be placed on-line with the remaining adsorber.

Each single adsorber charge--removal of spent material and reloading with virgin carbon--shall be compatible with a single delivery truck. Carbon transfer shall be accomplished hydraulically in slurry form and without human contact with the carbon, in a closed loop piping system, in order to minimize environmental exposure. The carbon transfer shall be able to be conducted with air pressure as the motive force in order to minimize the amount of water utilized in the operation. Supplier must demonstrate that following removal of spent carbon there is less than five (5) cubic feet of material remaining in the adsorber.

If the carbon is reactivated, it must be accomplished in a facility permitted to accept RCRA manifested material. If unsuitable for reactivation and reuse, the Carbon Adsorption system supplier shall assist the owner in the proper disposition. Therefore, a Procedure for Qualification of Materials of RCRA permitted TSDF, should be made available.

1105. EQUIPMENT

A) Adsorber Vessels

Adsorbers shall be vertical cylindrical pressure vessels with a semi-elliptical top head. The adsorber shall be designed such that the carbon is contained in a bottom cone (minimum 45°) such that it can be easily discharged when spent. The vessels shall be designed, constructed and stamped in accordance with the ASME Code, Section VIII for a design pressure rating of 75 psig at 150°F. The vessel shall be equipped with a 20-inch round, flanged manway on the side for maintenance access, and any other manway openings as may be required by code or for maintenance as recommended by the Supplier. All nozzle connections must be flush on the inside of the shell and provided with 150 pound flat face flanges on the outside.

Adsorbers shall be constructed of carbon steel and shall have all welds and any other sharp edges ground smooth, and all imperfections such as skip welds, delaminations, scabs, slivers and slag corrected prior to abrasive blasting. All surfaces are to be degreased prior to sandblasting. The adsorber internal surface that will be lined shall be blasted to a white metal surface (SSPC-SP5) to provide an anchor pattern in the metal corresponding to a degree of profile of 4 mils, minimum. The exterior of the adsorber shall be sandblasted or power tool cleaned to the degree specified by SSPC-SP2-63.

The interior of the adsorbers that will be in contact with the GAC shall be lined in order to prevent corrosion that will occur when wet activated carbon is in contact with carbon steel. This lining shall also exhibit abrasion-resistant qualities to prevent erosion by movement of the granular media. The finished lining shall be a minimum 35 mil dry film thickness to insure protection of the steel surface for a satisfactory period. A coating shall be used which exhibits excellent chemical resistance to a wide range of water solutions, and meets requirements of the U.S. Federal Register, Food and Drug Regulations Title 21, Chapter 1, Paragraph 175.300.

Following cleaning of the exterior, finish painting using an epoxy mastic coating system to a total DFT of 6 mils (in two applications) for outside service must be applied to the

exterior of the adsorber before rust can form. The two coat system shall be Sherwin Williams B58 Series consisting of a high solids, polyamine/bisphenol A epoxy formulation.

Adequate freeboard space, consisting of a least 50% of the carbon bed depth (on the vessel side shell), shall be provided in the side shell height. This free board will allow for backwashing of the carbon bed to remove filtered particulates, should it be necessary. Flow for backwash shall be approximately 1,200 gpm to effect a 35% bed expansion.

B) Underdrain Collection System

There shall be a collection system at or near the bottom of the carbon bed to collect treated water across the carbon bed cross section. The collection device(s) shall have slots of a determined width to retain the Granular Activated Carbon and allow free passage of treated water with a minimum pressure drop. The treated water is collected by this system and discharged from the adsorber to the affluent pipe. In no case will material foreign to GAC, (such as sand or gravel) be installed inside the adsorber to assist treated water collection.

C) Piping Network

A process piping network shall be provided for each set of adsorbers that will enable the following functions to be performed:

1. Treatment - Under normal operation, the design flow shall be accepted and directed to the multiple operating in parallel. The interconnecting piping shall allow for parallel operation. The effluent from the units operating in parallel shall be directed to the system effluent connection.

Capabilities for operation of the twinskid mounted vessels in series shall be provided for future operation if desired, with interconnection piping required to treat half of the design flow rates.

2. Carbon Exchange - During carbon exchange, the adsorber being exchanged shall be isolated completely from the treatment process with valving on influent and effluent lines. The process flow shall then either be reduced by 50% if operation is in parallel, or directed solely to the polish adsorber (to be lead adsorber after carbon exchange) in a series operation.

3. Adsorber Backwash - The adsorption system piping shall enable the unit to be backwashed should an unacceptable pressure drop develop across the carbon bed due to introduction of filterable solids to the system. In case of backwash, the adsorber being backwashed shall be isolated from the process flow, as during the carbon exchange procedure. Normal backwash capability shall be a design to effect approximately 35% bed expansion. Carbon treated water at a rate of 1,200 gpm shall be introduced to the underdrain collection system, and, upon existing the top of the adsorber, be directed to a single connection point for all backwash connections at the treatment area limits as indicated on the drawings.

D) Process/Utility Piping

The process and utility piping on the Adsorption System shall include influent water to the system and treated water adsorber vent lines, and Granular Activated Carbon supply and discharge piping. The process or influent/treated water piping shall be installed such that the adsorbers can be operated in normal parallel or series operation for future conditions. Each vessel shall have independent vent, carbon fill and discharge lines. The design of the piping and underdrain system is meant to treat water equal to or above pH 7, or otherwise not corrosive to carbon steel material.

With the exception of GAC discharge piping, all piping shall be carbon steel piping, constructed of ASTM A53, Grade B carbon steel rated 150 psig at 500°F. For 1-1/2 inch or smaller, pipe shall be threaded, Schedule 80 pipe, and for 2" and larger, pipe shall be plain end, Schedule 40 Pipe.

For 2" and larger, piping shall have cast iron flanges conforming to ASTM A126, Class A, faced and drilled for Class 125.

Carbon discharge piping to and including the shut-off valve and fittings shall be polypropylene lined steel per Dow Chemical Company's MORAF PPL brand, rated at 150 psig to 225°F. Piping shall be Schedule 40, ASTM A53 steel pipe with 125 pound ASTM A126, Class A cast iron flanges and fittings.

The exterior of the piping shall be power tool cleaned to the degree specified by SSPC-SP3-63 with a finish exterior painting of an epoxy mastic coating system for outside service must be applied to the exterior of the piping before rust can form. The two coat system shall be a total 6 mil DFT of Sherwin Williams B58 Series coating, consisting of high solids, polyamine/bisphenol A epoxy formulation.

E) Process/Utility Valves

The process and utility piping, excluding GAC full and discharge piping shall be equipped with butterfly valves for flow control purposes. Butterfly valves to be cast iron, one piece water type body with aluminum-bronze disc and stainless steel, one piece through shaft to mate with 150 pound ANSI flanges. Valve to be rated for 200 psig in closed position at 212°F, and to meet or exceed all of the design strength, testing and performance requirements of AWWA Specification C-504-70.

Valves on the GAC fill and discharge pipe shall be 316 stainless steel full bore ball valves with TFE seats and seals, wrench operated with 150 lb. ANSI flanged ends.

Valving for the compressed air supply shall be bronze or forge brass or barstock brass body regular port ball valves, rated for 500 psig at 100°F.

F) Transfer Hose Connectors

The Granular Activated Carbon piping shall be fitted with hose connectors, such that carbon transfer to and from the adsorbers can be facilitated with transfer hoses. These connectors shall be 4' Quick Disconnect Adapters constructed of corrosion resistant material as manufactured by Parker-Andrews Company as NY-LAST Coupling Model 400E or equal.

G) Transfer Hose

Adequate length of transfer hose shall be provided by the carbon supplier for each carbon shipment or provided to Owner during initial carbon shipment. Hose shall be 4" in diameter with a smooth internal surface such as nitrile rubber or teflon and a water resistant external surface such as PVC. Hose shall be reinforced and rated at a pressure of approximately 50 psig at ambient temperature. Hose shall be equipped with connectors at both ends as described above.

H) Flush Connections

Two flush connection shall be provided on each GAC fill line, one upstream and one downstream of the valve, and one flush connection downstream of the GAS discharge valve. Connection shall be welded into steel pipe or supplied in solid polypropylene "spacers" for lined pipe. Flush connections shall consist of a short section of 3/4" pipe, and a 3/4" full port ball valve and 3/4" quick disconnect adapter to match the water hose.

I) Pressure Relief

A pressure relief device shall be provided, with relief capacity as required by ASME Code and hydraulic system analysis. Relief venting shall be integral to Adsorption System piping and directed to a common collection point.

J) Pressure Gauges

The process piping shall be equipped with pressure gauges to indicate the pressure of water entering and existing each adsorber to provide information on pressure drops across each adsorber and the system. The pressure indicating gauge shall be 4-1/4" (face diameter size) with a stainless steel bourbon tube in a glycerin filled housing. The gauge shall read 0-100 psig with an accuracy of 1% of full range, and shall be a Weksler AA4P-liquid fill or equal.

K) Steel Skid

The adsorption system shall be provided with a steel skid mounting the adsorbers and containment of piping (not transport of system). Skid shall consist of two lengthwise A36 steel channels (W12x26, min.) and all necessary cross-bracing. Skid shall include a checkered plate to comprise an operating area for valve operation and system monitoring (pressure readings/sample ports). Slots shall be provided in supporting channels for installation on foundation if required. The steel skid shall be finish painted similar to the

exterior of the carbon steel piping as described in above.

L) Air Release Valves

Adequate air release provisions shall be provided on influent piping to allow unit to continuously discharge air that may enter system. Vacuum air checks shall be provided on the air release valves to prevent the units from allowing air to enter the system during potential vacuum conditions.

1106. GRANULAR ACTIVATED CARBON

A) General

Twenty thousand (20,000) pounds of Granular Activated Carbon shall be provided and installed within each adsorber vessel.

B) GAC Specification

The activated carbon shall be virgin, granular and manufactured from bituminous coal. The activated carbon shall be Calgon Carbon Corporation Filtrasorb 300 or equal and conform to the following specifications:

Iodine Number (minimum)	900
Abrasion No (minimum)	75
Effective Size	0.8 - 1.0 mm
Screen Analysis	
on mesh (maximum %)	15
through 30 mesh (maximum %)	4
Water Soluble Ash (maximum %)	1
Total Ash (maximum %)	10
Moisture as packed (maximum %)	2
Total Phosphate, as PO ₄ (maximum %)	1

C) GAC Analysis

The delivered activated carbon must be accompanied by an analysis sheet certifying compliance with the specifications.

1107. START-UP

The system supplier shall provide the services of an engineer or qualified technician who will be responsible for inspection of the adsorption system, mechanical trouble-shooting, system start-up service and operator training. A minimum of two days of on-site field service shall be allowed for additional time requirements which the Owner is not at fault.

1108. WARRANTY

The system supplier shall warrant the system to be free from defects in materials and workmanship for a period of 18 months from acceptance of the Adsorption system.

1109. AWARD

A) General - Contract 2-91 will be awarded to lowest dollar amount for either option A, B, or C as further described in Article 16.4 in Instructions to Bidders and as described below.

B) Option Description

1. Option A to include:

- Alternative Additive No. 1 (installation and 18 month service fee for Unit Well 24)
- Alternative Additive No. 2 (installation and 18 month service fee for Unit Well No. 28)
- Alternative Additive No. 3 (carbon exchange)
- Alternative Additive No. 4 (purchase option)

2. Option B to include:

- Alternative Additive No. 1 (installation and 18 month service fee for Unit Well 24)
- Alternative Additive No. 2 (installation and 18 month service fee for Unit Well No. 28)
- Alternative Additive No. 3 (carbon exchange)
- Alternative Additive No. 5 (removal fee)

3. Option C to include:

- Alternative Additive No. 1 (installation and 18 month service fee for Unit Well No. 24)
- Alternative Additive No. 2 (installation and 18 month service fee for Unit Well No. 28)
- Alternative Additive No. 3 (carbon exchange)
- Alternative Additive No. 6 (renewal of monthly service)

A detailed description of the Alternative Additive items may be found below.

C) Initial Installation

The initial installation fee will include:

1. All mobilization and general expenses required to complete all installation work as indicated on the drawings and specifications.
2. Initial carbon for GAC vessels.
3. Complete installation and start-up services.
4. Complete accelerated column tests including shipping, handling, VOC testing, and report.

D) Monthly Service Fee for the entire 18 month rental period which would include usage of the complete G.A.C. absorption system and any "major" maintenance required during the rental period to allow the units to operate as intended, with payments made monthly after installation.

E) Alternative Additive No. 1. Initial Installation items and 18 month service fee for Unit Well No. 24.

F) Alternative Additive No. 2. Initial Installation items and 18 month service fee for Unit Well No. 28.

G) Alternative Additive No. 3

1. Complete Carbon Exchange per vessel (extended for all 14 vessels) including all transportation, removal and temporary storage requirements for spent carbon prior to unloading virgin carbon, proper disposal of spent carbon and water, virgin replacement carbon, and other miscellaneous items such as air supply labor and, temporary storage, and transfer has required for complete exchange. Carbon exchange cost to be quoted for July 1, 1991 exchange time with allowable escalation factor tied to latest available Producer's Price Index (PPI of Industrial Commodities as established by the U.S. Department of Labor.

H) Alternative Additive No. 4

Option to purchase GAC units at end of 18 months. Alternative No. 4 cost will be based on per vessel unit cost (extended to 14 units). Cost per vessel will include all piping, skids, valving, gauges, and miscellaneous items left at a site. Purchase will be made in multiples of two vessels mounted on skids in place.

I) Alternative No. 5

Removal cost per vessel (extended to all 14 vessels). Cost per vessel includes removal of vessel, spent and unspent GAC with disposal, removal of skids, piping and miscellaneous equipment from site. Removal to be made in multiples of two vessels on skids.

J) Alternative No. 6

Renewal of monthly service option on an annual basis, per vessel, per month, at the end of the initial 18 month period, subject to PPI escalation factor. Monthly cost for the 12 months after initial 18 months to be adjusted from July 1, 1991 PPI index. Total Alternative cost to be estimated at a 12-month extension for 14 vessels, which equals 168 vessels month.

DIVISION 15 - PLUMBING

1500. SCOPE

A. Applicable provisions of Division 1 shall govern work in this division.

B. In general, the work includes:

1. All piping and valves of every description.
2. Excavation, dewatering, and backfilling for all work under this contract unless otherwise noted.
3. Concrete foundations, and anchor bolts for all equipment furnished under this contract.
4. Piping connections to all equipment, whether furnished under this contract or not.

C. Work Included:

- 1500. Scope
- 1501. General
- 1511. Pipe and Pipe Fittings
- 1512. Valves
- 1513. Piping Appurtenances and Miscellaneous Materials
- 1517. Installation of Pipe and Appurtenances

D. Work of Other Sections

Unless otherwise specified, all mechanical equipment, piping and valves shall be furnished shop-primed with Tnemec, Glidden, or equal primer, in accordance with the requirements of Division 9.

1501. GENERAL

A. Materials of Construction

All materials used in the manufacture, assembly and painting of piping and valves in contact with water shall be compatible with the NSF approved for potable water supplies. Materials in contact with chemical feed systems shall be compatible with the chemicals being used. All glues, solvents, solders, etc., shall likewise be compatible for the application intended.

B. Testing

Contractor shall include the cost of all testing, cleaning and disinfection in the price bid.

All piping, underground, interior or exposed, shall be subject to test before being covered with ground, insulation, or paint. All piping and appurtenances shall be watertight or airtight and free from visible leaks.

All piping shall be flushed or blown out after installation prior to testing. Contractor shall provide all necessary piping connections, water, air, test pumping equipment, water meter, bulkheads, valves, pressure gauge and other equipment, materials and facilities necessary to complete the specified tests. Contractor shall provide all temporary sectionalizing devices and vents as required for testing.

1. Pressure Tests

The test pressure in all lines shall be held for one hour during which time the leakage allowance shall not exceed that specified. In case repairs are required, the pressure test shall be repeated until the pipeline installation conforms to the specified requirements and is acceptable to Engineer. Pumps, air compressors, instrumentation, and similar equipment shall not be subjected to the pressure tests.

<u>Fluid Abbreviation or Name</u>	<u>Minimum Test Pressure in psi</u>	<u>Test Medium</u>	<u>Leakage Allowance Designation</u>
Potable Water	150	Water	"A"

Leakage allowance designation "A" shall mean zero leakage for unburied pipe and not more than 0.002 gallon per hour per inch diameter per 100 feet of buried pipe for compression or solder joint pipe. Buried mechanical and push-on joint pipe shall meet the leakage specifications of AWWA C600.

C. Cleaning and Disinfection

All equipment and materials shall be clean before installation. The Contractor shall disinfect and flush the system before it is put on line. Water main shall be disinfected according to AWWA C651.

1511. PIPE AND PIPE FITTINGS

A. Size and Type

All materials shall conform to the size and type shown on the drawings or called for in the specifications. In joining two dissimilar types of pipe, standard fittings shall be used when

available. In the event fittings are not available, the method of joining shall be as approved by Engineer.

B. Ductile Iron Piping

Unless other wise shown or specified, all interior piping four inches in diameter or larger shall be ductile iron conforming to AWWA C151. Interior piping shall be minimum Class 53 with a minimum rated working pressure of 250 psi. Exterior piping shall conform to AWWA C151 with wall thickness provided in accordance with AWWA C150 for the depth of cover shown on the drawings using a minimum rated working pressure of 350 psi and Laying Condition 4; minimum Class 52, unless otherwise shown or specified. The words "ductile iron", weight and class of pipe shall be plainly marked on each piece of exterior pipe.

Except where shown, pipe joints shall be flanged. Flanged joints shall conform to AWWA C110 and C115 and shall be compatible with ANSI B16.1 Class 125. Flanges shall be cast or ductile iron. Flanged gaskets shall be minimum 1/8-inch thick rubber ring gaskets. Thicker gaskets shall be provided as recommended by the manufacturer to meet joint tolerances. Flange bolts shall be standard steel with hex head and hex nuts for the rated working pressures and installation conditions specified or shown. Where shown mechanical joints and gaskets shall conform to AWWA C110 and AWWA C111. Bolts on mechanical joints shall be high-strength low-alloy steel conforming to AWWA C111 with certificate to that effect shall be provided.

Except where shown, interior fittings shall be flanged of ductile or cast iron. Flange fittings shall conform to AWWA C110 and ANSI B16.1, as applicable, with a minimum rated working pressure of 150 psi.

Except where shown, exterior fittings shall be mechanical joint. Mechanical joint fittings and gaskets shall comply with AWWA C110 and C111, as applicable, with a minimum rated working pressure of 150 psi.

Where shown or identified as "restrained" mechanical joints the contractor shall provide and install a field-installed thrust restraint system. The mechanical joint restraint shall be incorporated in the design of the follower gland and shall include a restraining mechanism which, when actuated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. Flexibility of the joint shall be maintained after installation. Glands shall be manufactured of ductile iron conforming to ASTM A 536-80. Restraining devices shall be of ductile iron heat treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell and tee-head bolts conforming to ANSI/AWWA A21.11 and ANSI/AWWA C153/A21.53 of latest revision. Twist-off nuts shall be used to insure proper actuating of the restraining devices. The mechanical joint restraint device shall have a

working pressure of at least 250 psi with a minimum safety factor of 2:1 and shall be EBAA Iron, Inc., MEGALUG or equal.

All flanged sections of pipe shall be made up in accordance with AWWA C115 specifications. No field make-up flanges will be allowed unless strictly conforming to AWWA C115 with facing done after turning pipe through flange.

All pipe and fittings shall be cement-mortar lined and asphaltic coated inside and shall be shop primed outside. Cement-mortar lining shall be in accordance with AWWA C104. Asphaltic coating shall conform to applicable standards herein for the pipe and fittings. Shop priming with products equal to and compatible with those listed under painting in Division 9 of these specifications shall be provided.

C. Copper Piping

Copper piping shall conform to the requirements of the "Specifications for Seamless Copper Water Tube", ASTM B88. All interior or above ground potable and non-potable water supply piping three inches in diameter or smaller shall be Type K hard copper. Fittings shall be soldered or sweated on and shall be of cast bronze or forged brass containing 85% copper. All underground water supply piping three inches or smaller shall be Type K soft copper with compression fittings. Joints shall not be used under floor slabs. Shutoff valves shall be placed on each branch for all underground, above ground or interior piping.

1. Drain lines, and lines to pressure gauges above the floor shall be rigid, Type K, hard copper. An ample number of unions shall be provided for disassembling.
2. Provide 3/8-inch brass smooth end sampling cocks on piping as shown on drawings.

D. Galvanized Iron Piping

Where shown or specified, all galvanized piping shall be Schedule 40 galvanized iron pipe, with galvanized malleable iron fittings. An ample number of unions shall be provided for disassembling pipe. Pipe shall conform to the "Specifications for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses", ASTM A-53.

E. PVC Piping

All chemical feed lines shall be constructed of PVC. PVC shall conform to ASTM D1784, Class 12454-B. PVC piping and fittings shall be PVC 1120, schedule 80, high impact conforming to ASTM D1785 with bells conforming to ASTM D2672. Solvent weld fittings shall conform to ASTM D2467 and, for threaded, ASTM D2464. All piping shall be approved for use by the National Sanitation Foundation. All pipe delivered to the job site shall be properly marked for type, grade, and design stress rating. Expansion joints shall be

provided as required. In general, all joints shall be solvent weld, except where flanges are shown on the drawings or where transition to another pipe material is required. Pipe shall be installed in compliance with ASTM D2321 except as otherwise specified herein.

1512. VALVES

A. Gate Valves

Where shown on the drawings, gate valves in lines four inches in diameter or larger, shall be AWWA C500 cast iron, bronze trimmed, non-rising stem, double disc, parallel seat, Class 150, O-ring packing box. All interior valves shall have handwheels. Right angle operators shall be furnished if required because of valve position.

Shutoff valves in water lines three inches to one inch in diameter or smaller shall be gate valves, Class 150 bronze or iron body bronze mounted, double disc, parallel seats, threaded, rising stem, Crane No. 440, Walworth, or equal. Provide unions for ease of valve removal.

B. Check Valves

Check valves in well pump discharge lines to G.A.C. vessels shall be of the flanged, globe style, silent operating type with zero leakage when closed. Check valves shall be Val-matic 1800 series silent check valves, or equal.

The valve design shall incorporate a center guided, spring loaded poppet, guided at opposite ends and having a short linear stroke that generates a flow area equal to the pipe.

The valve disc shall be concave to the flow direction providing for disc stabilization, maximum strength and a minimal flow velocity to fully open the valve.

The valve disc, seat and bushing shall be field replaceable and have a Buna-N seal to provide zero leakage.

The seal design shall provide for both a metal to metal seal and a metal to Buna-N seal to achieve resilient sealing at both low and high pressures without overloading or damaging the Buna-N seal.

Valve body shall be cast iron (ASTM A126; Class B) with bronze seat, plug and bushings (ASTM B584). Spring shall be 304 stainless steel (ASTM A313).

Flanges shall be ANSI Class 125 (ANSI B16.1).

C. Butterfly Valves

1. General

Except as otherwise specified or shown on the drawings, shut-off valves in lines four inches in diameter or larger shall be butterfly valves. Butterfly valves shall be AWWA C504, short body, Class 150B. Provide certified drawings by manufacturer, and affidavit of compliance.

Valve bodies shall be cast iron (ASTM A126, Class B) or ductile iron ASTM A536. Valves shall be flanged and conform to ANSI B16.1 Class 125. Valve shaft shall be stainless steel. Valve disc shall be cast iron. Valve seat shall be constructed of synthetic rubber compound and shall be recess mounted and bonded in the valve body. Valve shaft bearing shall be self-lubricating teflon nylon or bronze. Shaft shall have split V-type packings that are replaceable without removing the valve from the line.

Contractor will provide motor operated butterfly valves with operator and controls. Installation, flow switch and wiring by contractor for Contract 1-91.

2. Standard Operators

Except as noted below, butterfly valves shall be equipped with top-mounted handwheel operators with totally enclosed, sealed and lubricated gear boxes. The rated torque capability of each operator shall be sufficient to seat, unseat and hold any valve disc position with the maximum pressure differential across the valve without creep or fluttering. The valve shall be equipped with valve disc position indicators and shall be equipped with adjustable mechanical stop-limiting devices.

3. Motor Operator

Electric valve operators shall be installed on motor operated valves in conformance to specifications in this section. Motor operator supplied by Contractor. Contract 1-91 to install and wire for complete operations.

D. Electric Valve Operators

Contractor to provide electrical valve operator Limitorque, Auma, or equal. Operator to have space heating element in housing. Operator shall be capable of holding valve in an intermediate position between fully open and fully closed without creeping or fluttering. Gearing on electrical operators shall be totally enclosed and shall operate in lubricant. The operator shall have torque capabilities at least 1-1/2 times the required torque. Torque switches shall be provided on operator to stop motor operation in the event of a mechanical overload. Handwheel shall be provided for manual opening and closing of valve without electric power. Valve to include position indicating dial with Operator positioned to accommodate installation conditions.

An integral valve operator motor starter with push button station for local control shall accompany each valve. Push button station shall minimally consist of three push buttons for open, close and stop control and two lights to indicate valve position. Green shall indicate fully open and red shall indicate fully closed. Both lights shall be on when valve is in intermediate position. Valve controls to include local/remote switch.

Valve controls shall allow for valve operation to occur automatically when treatment system is in operation or bypassed entirely when treatment units are not utilized.

The function of the valve is as follows:

Operation of valve shall be interlocked with the control of the corresponding well pump motor when placed in automatic control or bypassed when placed in manual or off position.

Valve shall act to keep G.A.C. vessels full of water when well pump is shut off. The valve shall open and close slowly under operation and shall include all necessary accessories, limit switches, contacts and controls to accomplish these functions even though not specifically enumerated herein. General Contractor (Contract 1-91) to provide all wiring, MCC modifications, (time delays) and flow switches to operate motor valve controls.

1. The motor operated valve shall open to 90° in no less than 60 seconds after the well pump motor starts. Valve position sensing shall be by a flow switch installed upstream of the valve.
2. If the valve does not open after 60 seconds, the well pump motor shall be stopped.
3. On normal shutdown, the valve shall close in no less than 60 seconds and the well pump motor shall be stopped when the valve is closed.
4. Normal pressure at the motor operated valve is 1 psi while open. Pressure while closed will be up to 75 psi on upstream side when pump is not operating and as low as 0 psi on downstream side.

E. Air Release Valve

The well pump combination air and vacuum release valve shall be 6-inch Val-Matic No. 106WS or equal with a Valmatic Model No. 22 continuous air release valve attached to main valve with shutoff capability. The valve assembly shall include a 6-inch gate valve to isolate combination air release valve and an anti-slam surge check device. Contractor shall run 6-inch pipe from the top of the valve to a downturned elbow outside of building as shown with end of pipe screened with non-corroding 24 mesh. Support discharge piping as approved by Engineer to avoid conflicts at wall.

F. Miscellaneous Valves

Shutoff valves in potable water lines smaller than one inch shall be Jenkins Fig. 106-A (threaded) or Jenkins Fig. 1200 (solder joint) Walworth Fig. 95 (threaded) or Walworth Fig. 95-SJ (solder joint) Apollo 70-100 series (threaded), Apollo 70-200 series (solder joint) or equal, bronze 300 psi globe or ball valves.

Provide unions for ease of valve removal. For transition from PVC to metal use Chemtrol transition unions.

1513. PIPING APPURTENANCES AND MISCELLANEOUS MATERIALS

A. General

Piping appurtenances shall be made of the materials specified and to the satisfaction of Engineer. All valves or appurtenances not designated as to type shall be subject to approval of Engineer.

B. Concrete

All concrete poured under this Contract, unless shown or specified otherwise, shall conform to the requirements of Division 3.

C. Pipe Coupling

Pipe couplings identified on the drawings shall be equal to Dresser Type 38 coupling. Contractor shall furnish tie ears and tension ties if required.

D. Tension Ties

All tension ties, rod ties and control rods shall be provided to resist a minimum 150 psi (250 psi) pressure in the pipe line. Contractor shall provide tie ears to secure tension rods to flanges or other Engineer approved locations. Rods shall be provided with nuts and washers on both sides of tie ears. All nuts shall be carbon alloy steel conforming to A563 and washers shall be hardened steel conforming to ASTM F436. Rods shall be ASTM A36 steel at a minimum. Tie rods shall be equally spaced around pipe. The following table lists the minimum number and diameter in inches for the tie rods for various sizes of pipe.

Pipe Size (inches)	150 psi Pressure		250 psi Pressure	
	Minimum Number	Minimum Size (inches)	Minimum Number	Minimum Size (inches)
4-10	4	5/8	4	5/8
12	4	4/8	4	3/4
14	4	3/4	4	7/8
16	4	3/4	4	1
18	4	7/8	4	1-1/8
20	4	1	4	1-1/4
24	4	1-1/8	4	1-1/2
30	4	1-3/8	7	1-3/8
36	8	1-1/4	8	1-1/2
42	12	1-1/8	12	1-1/2
48	11	1-3/8	22	1-1/4
54	11	1-1/2	22	1-3/8

E. Pressure Gauges

Gauges are to be aluminum 4 1/2-inch ASA Grade AA combination bourdon gauges with accuracy of 1/2% scale range as manufactured by H. O. Trerice Co., or equal. Each gauge to be equipped with Trerice Catalog No. 872-2 or equal pressure snubber and brass shutoff valve. Gauges shall be graduated in psi with range 0 to 100 psi.

1517. INSTALLATION OF PIPE AND APPURTENANCES

A. Interior or Exposed Piping

All interior or exposed pipelines shall be securely supported by adjustable saddles, brackets, or adjustable hangers supported directly by concrete, masonry work, or tile. Strap hangers, tin clips, or U-hooks will not be acceptable. Piping shall be supported, even though not shown on the drawings, using base fittings and concrete pads to six inches above the floor, Grinnell 264 or equal adjustable pipe saddle stand with floor flange to six feet above the floor, and Grinnell or equal adjustable iron or heavy steel pipe hangers with supporting clamps or inserts more than six feet above the floor. In general, the maximum spacing of supports shall not exceed 10 feet on centers unless approved by Engineer. Plumbing system shall be installed with hangers and supports in accordance with the Plumbing Code. Insulation saddles shall be used at supports of insulated piping. Contractor shall furnish and place hangers, supports, wall pipes, sleeves, and floor boxes in the forms before concrete is poured wherever needed or shown on the drawings.

Pipe roller supports for influent and effluent piping to G.A.C. treatment area shall be adjustable pipe roll-supports equal to Grinnel Figure 177, suitable for exterior use.

All piping shall be adequately supported and braced to resist thrust at bends and joints. Use base elbows, poured concrete, rod ties or restrained joints as indicated.

The weight of the piping shall be supported independently of connected equipment.

Where pipes pass through concrete members without wall fittings shown, Contractor shall install sleeves in the forms for the piping. The sleeve diameter shall not exceed the pipe O.D. plus two inches, unless otherwise shown on drawings. If the concrete members are to be watertight, the annular space around the pipe shall be sealed with an approved mechanical seal. For copper pipe provide an elastomeric sleeve on pipe where it passes through walls or slabs.

Where pipes pass through non-watertight walls, the annular space shall be grouted full. Where pipes pass through non-watertight floors, the sleeve shall extend one inch above the finished floor elevation and the annular space shall remain open.

Where new pipes go through existing watertight concrete members, Contractor shall core a hole through the wall and install a wall sleeve or wall pipe. Space between wall sleeve or wall pipe and concrete shall be filled with non-shrinking mortar. The annular space between the wall sleeve and pipe shall be sealed with an approved mechanical seal. Where new pipes go through existing non-watertight concrete or masonry members, holes shall be cored and grouted full (walls), remain open (floors). Plug abandoned pipes and wall pipes, after pipe and fitting removal flush to the concrete surface, with non-shrinking mortar, or as otherwise approved to achieve a water tight seal.

Non-shrink mortar shall be All-Crete as manufactured by Concrete Products, Inc., Woodland, California; Speed Crete as manufactured by Tamms Industries Co., Itasca, Illinois; or equal. Non-shrink mortar shall be placed in accordance with manufacturers recommendations.

No chases or recesses shall be made in poured concrete for pipe installation and no pipe shall run in poured concrete unless called for in the drawings or specifications or permitted by Engineer. The cutting or core drilling of concrete for pipe shall be avoided wherever possible, and in no case where such cutting or core drilling is necessary shall reinforcing rods be cut or disturbed without permission of Engineer. All openings for pipe work shall be neatly patched in a workmanlike manner.

Exposed piping shall run straight, in neat parallel lines, and shall be located far enough from walls, ceilings and floors to permit access for covering of pipe and painting work. Care shall be taken in laying out piping that there is no interference with the proper location of piping

for other purposes or other equipment, and shall be run with regard to the requirements of each service.

Piping shall not interfere with headroom or clear floor space. Unless otherwise shown, small water piping shall be concealed in (except reinforced concrete walls) walls placed in piping pits, above suspended ceilings, or under floors where possible or as shown on the drawings. Pipes under floors shall have a minimum of 6 inches of sand cover. Plates shall be provided on all uncovered pipes passing through floors, walls and ceilings constructed of materials other than poured concrete. Plates shall be on exposed sides and shall be chrome plated, spring and snap type.

An ample number of unions shall be installed in all threaded, soldered and glued pipelines and at all equipment to facilitate removal and replacement.

The appropriate number and size and lengths of spool pieces and flange fillers needed for plumbing and leveling any existing piping shall be included in the price bid.

B. Pavement Repair

Unless otherwise specified, Contractor shall replace all bituminous and concrete pavement removed or damaged during performance of the work. Concrete pavement replacement shall conform to Division 3. Bituminous pavement replacement shall conform to Division 2.

ATTACHMENT IV

**ILLINOIS DEPARTMENT OF PUBLIC HEALTH, REQUIREMENTS FOR
SEALING ABANDONED WELLS**

**PUBLIC HEALTH***A Healthier Today For A Better Tomorrow*

Bernard J. Turnock, M.D., Director

REQUIREMENTS FOR SEALING ABANDONED WELLS

EXCERPTED FROM

ILLINOIS WATER WELL CONSTRUCTION CODE

a) Abandonment of Wells.

- 1) The owner of a water well, boring, or monitoring well shall assure that such well is sealed within thirty (30) days after it is abandoned and no longer used for the purpose for which it was intended. The Department shall grant an extension of this time provided the owner submits a written request to the Department indicating the reasons for the request and an estimate of time in which the well will be either sealed or reused. In granting an extension, the Department must be assured that applicable protective measures will be taken and the methods and materials will be in compliance with the Act and this Part. Applicable protective measures may include ensuring sources of contamination are down grade from the water source or isolation of the potential source of contamination in such a manner as to prevent a route of contamination of the ground water, or isolating the potential source of contamination to prevent accidental introduction of contaminants into ground water.
- 2) Wells shall be sealed by a licensed water well driller pursuant to the Water Well and Pump Installation Contractor's License Act. A person who is not so licensed may seal a well, provided a request is made to the Department prior to the commencement of sealing indicating how the well is to be sealed and the materials to be used. The Department shall grant approval when requested prior to the commencement of sealing if the methods and materials are in compliance with this Section.

b) Sealing Requirements. Wells, borings, or monitoring wells which are abandoned shall be sealed by placing the sealing materials from the bottom of the well to the surface by methods that will avoid segregation or dilution of material in accordance with the following requirements:

- 1) Non-creviced, Consolidated formations. Wells extending into non-creviced sandstone, or other water bearing consolidated formations shall be sealed by filling the well with disinfected clean sand free of mud or dirt, or pea gravel to the top of the water bearing formation or to within 10 feet of the casing, whichever is less. Disinfection shall be accomplished by treating the area of the well which penetrates the aquifer in accordance with Section 920.100(b). Neat cement containing bentonite, aquajel or similar materials from 2% to 6% by weight or pure bentonite in any form shall be placed for a minimum of 10 feet above this point or to the top of the water bearing formation, whichever is greater. A clay slurry or impervious material shall be used to fill the upper part of the well to the surface.
- 2) Creviced formations. Wells extended into creviced formations shall be sealed by filling with disinfected clean pea gravel to the top of the water bearing formation or to within 10 feet of the casing whichever is less. Neat cement containing bentonite, aquajel or similar materials from 2% to 6% by weight, or pure bentonite in any form shall be placed for a minimum of 10 feet above this point or to the top of the aquifer, whichever is greater. A clay slurry or impervious material shall be used to fill the upper part of the well to the surface.

- unconsolidated formations. In the event the water bearing formation consists of coarse gravel and producing wells are located nearby, the well shall be sealed by filling with disinfected clean pea gravel to the top of the water bearing formation. Neat cement containing bentonite, aquajel, or similar materials from 2% to 6% by weight, or pure bentonite in any form shall be placed for a minimum of 10 feet above this point. Clay or impervious material shall be used to fill the remaining upper part of the well to the surface. Abandoned wells extending only into unconsolidated formations near the surface can be sealed by completely filling with concrete, cement grout, neat cement or clay.
- 4) More than one water bearing formation. Where wells extend into more than one water bearing formation, each water bearing formation shall be sealed independently in the manner described in this Section depending upon the type of formation encountered. A neat cement plug shall be placed a minimum of 10 feet above and below all intermittent water bearing formations. Disinfected clean pea gravel shall be placed in each water bearing formation between plugs. A clay slurry or other impervious materials shall be used to fill all other parts of the well between plugs and the upper part of the well to the surface.
 - 5) Artesian wells. In such wells, a cement retainer shall be used with pressure grouting equipment utilized to place cement grout. Neat cement shall be placed for a minimum of 10 feet above the water bearing formation. A clay slurry or other impervious materials shall be used to fill the upper part of the well to the surface.
 - 6) Where the well casing consists of brick, stone, concrete blocks, porous tile, or other porous material, the casing shall be removed to a depth of at least ten (10) feet below the surface.
 - c) Non-Producing well. Where a water well is drilled and a water bearing formation is not located, the water well shall be filled with clay, drill cuttings, or neat cement containing bentonite, aquajel or similar materials from 2% to 6% by weight, or pure bentonite in any form by the water well driller not more than ten (10) calendar days after the well has been drilled.
 - d) The well casing shall be removed to at least 3 feet below final grade.
 - e) Notification.
 - 1) The Department, approved local health department, or approved unit of local government shall be notified by telephone or in writing at least 48 hours prior to the commencement of any work to seal a water, or monitoring well.
 - 2) The Department shall be notified when a water, boring, or monitoring well is sealed by the owner of the water well not more than 30 days after the water well is sealed. The following shall be submitted on forms provided by the Department:
 - A) The date the water well was drilled.
 - B) Depth of the well and diameter.
 - C) Location of the well.
 - D) Type of sealing method used.
 - E) Original water well permit number.
 - F) Date the well was sealed.
 - G) Type of well (boring, dug, or drilled).
 - H) Whether the formation is clear of obstructions.
 - I) Casing Record (explanation of the required removal).
 - J) Water Well Drillers License number and name.

(Source: Amended at 14 Ill. Reg. 15338, effective January 1, 1990)



ILLINOIS DEPARTMENT OF PUBLIC HEALTH

(217) 782-5830